CALIFORNIA FISH AND GAME

"CONSERVATION OF WILD LIFE THROUGH EDUCATION"

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A BRIEF HISTORY OF THE CALIFORNIA FISH AND GAME COMMISSION.

By Harold C. Bryant.

INTRODUCTION.

The California Fish and Game Commission having completed fifty years of service to the state in the administration and conservation of wild life resources, it seems fitting that a review of the problems of the past and their solution, together with an outline of the distinctive accomplishments of one of the oldest state commissions, be published, to the end that the work of this Commission may be better understood and

appreciated and that future activities may be governed by the successes or failures of the past.

Under the administration of Governor H. H. Haight, the legislature of 1870 established a Board of Fish Commissioners under "An act to provide for the restoration and preservation of fish in the waters of this state." The bill was approved on April 2, 1870, and Messrs. B. B. Redding, S. R. Throckmorton and J. D. Farwell were appointed as commissioners. The former commissioner served the state for more than ten years.

The United States Commission of Fish and Fisheries was not established until a year later. California thus had an organized fish commission nearly a year before the federal government took up similar work. The appropriation of $5,000 was largely used in importing new varieties of fish and in preserving those native fish which were recognized as valuable food fish. It was not until 1878 that the Commission was granted jurisdiction over game as well as fish.

"The first hatchery owned and operated by the state was situated on the grounds of the State University, in Berkeley. The California Acclimatization Society under the supervision of Mr. J. G. Woodbury had been experimenting, and had made several successful hatches of eggs introduced from the eastern states. Mr. Woodbury afterward became an assistant to Dr. Livingston Stone, at the Baird Hatchery, on the McCloud River, in 1872, when the first attempt was made to propagate the quinnat salmon in California.

INTRODUCTION OF FOOD AND GAME FISHES.

"The California Fish Commission during the first decade of its existence introduced into the waters of this state a number of varieties of food and game fishes and the attending results are regarded as being among the greatest achievements in fishculture and acclimatization."*

In the year 1872, an attempt was made to import from eastern states on a special aquarium car the following: black bass, glass-eyed perch, yellow perch, catfish, tautogs, brook trout, salt water eels, lobsters and oysters. Unfortunately, this large shipment never reached California owing to a train wreck which was described in the official report as follows:

"After leaving Omaha we stowed away as well as we could the immense amount of ice we had on the car, and having regulated the temperature of all the tanks, and aerated the water all round, we made our tea and were sitting down to dinner, when suddenly there came a terrible crash, and tanks, ice, and everything in the car seemed to strike us in every direction. We were, every one of us, at once wedged in by the heavy weights upon us, so that we could not move or stir. A moment after, the car began to fill rapidly with water, the heavy weights upon us began to loosen, and, in some unaccountable way, we were washed out into the river. Swimming around our car, we climbed up on one end of it, which was still out of water, and looked around to see where we were. We found our car detached from the train, both couplings having parted. The tender was out of sight, and the upper end of our car resting on it. The engine was three-fourths under water, and one man in the engine

*Shebley, W. H.: History of the Introduction of Food and Game Fishes into the Waters of California. California Blue Book, 1911, pages 513–527.

cab crushed to death. Two men were floating down the swift current in a drowning condition, and the balance of the train still stood on the track, with the forward car within a very few inches of the water's edge. The Westinghouse air-brake had saved the train. If we had been without it, the destruction would have been fearful.

"One look was sufficient to show that the contents of the aquarium car were a total loss. No care or labor had been spared in bringing the fish to this point, and now, almost on the verge of success, everything was lost." (Bienn. Rept. Fish Comm., 1872-1873.)

Undiscouraged by this loss the Commission asked Mr. Stone, who was in charge of the aquarium car, to return East and obtain a new shipment. With the help of the United States Bureau of Fisheries, 40,000 shad were secured in the Hudson River. These fish arrived safely and were planted in the Sacramento River at Tehama.

FIG. 28. Fisherman unloading catch of shad. Over a million and a half pounds of shad are taken annually in California. They were first introduced into the waters of the state by the State Fish Commission in 1871 and a second plant was made in 1873.

In the fall of 1872, a shipment of white fish eggs was secured in the East. These were hatched with success and 25,000 young white fish were planted in Clear Lake. During this period, Tahoe trout were introduced into several coastal lakes and streams. This constituted the first transplantation experiments.

On June 12, 1874, another importation which included black bass, glass-eyed perch, Schuylkill catfish, horn-pouts, silver eels, eastern salmon, rock bass, tautogs, lobsters and salt water eels, were distributed to different lakes and streams of the state. The tautogs were placed in San Francisco Bay and the white fish in Tulare Lake.

During the years 1876–1877 an attempt was made to acclimatize the awa, a fish from Hawaii. Apparently, there were no results from the

plant made near Bridgeport, Solano County. Efforts to better establish the white fish, shad, and other fishes were continued and additional importations were made. The striped bass was introduced in 1879 and the carp in 1880.

The first published report on the edible fishes of the Pacific Coast appeared in 1881.

In 1898, six fish hatcheries were in operation, as well as several egg-collecting stations, and the Sisson Hatchery had been enlarged to handle 16,000,000 eggs at one time.

In 1903–1904 additional attempts were made to introduce the greyling and the land-locked salmon. Although fish were planted, no results were obtained. At the same time four dozen elegant quail imported from Mexico were liberated, but soon disappeared. Chinese quail were the subject of still another acclimatization failure.

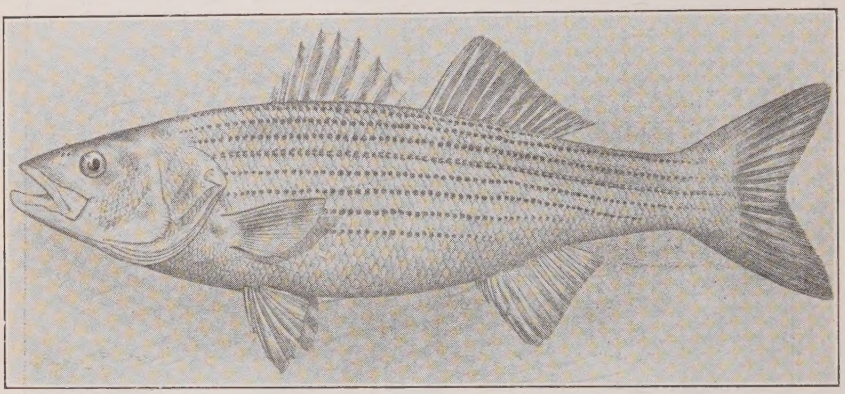

FIG. 29. Striped bass, *Roccus lineatus*, the successful introduction of which was accomplished in the year 1879, when 135 were planted near Martinez. A second plant was made in June, 1882, when about 300 were planted in Suisun Bay. The increase has been remarkable.

Continued interest in the introduction of new food fishes led to the importation and planting in 1908 of crappie, blue-gilled sunfish, yellow perch and ring perch, making about thirty different exotic species given a trial in the waters of the state. The above species have increased and are well established in the Sacramento and San Joaquin rivers. Attempted introduction of the ayu from Japan in 1920 met with failure.

Enthusiasm over the golden trout of the southern High Sierra led to many transplantations of this fish beginning in 1909 and 1910. As a result this species is now found 150 miles to the north of its original home in the head waters of the Kern River.

Transplantations of striped bass were also attempted in more recent years.

OUTSTANDING PROBLEMS AND ACHIEVEMENTS.

The first outstanding problem confronting the Commission was that of the pollution of coastal streams by sawdust from the mills. It was found that the fish life in those streams into which the refuse from mills was poured soon became barren and demand was made for legislation to prevent further pollution.

The need for fishways was apparent to the first board appointed and within a few years the building of them was made compulsory. The following quotation from the 1870–71 Biennial Report is of interest:

"At one dam on a tributary of the Truckee a mill owner consented to put in a fishway, at the earnest solicitation of one of the commissioners, and to prevent the expenses of a suit. He said the law was an infringement of his rights, and when the legislature passed an act to compel him to spend money in such foolish business they should have appointed a schoolmaster to teach the trout how to use the contrivance; he did not believe a fish could be coaxed to go near it. The next evening after the fishway was placed in position the fish were passing it every few minutes; the mill owner became a convert to the practical use of fishways. He soon tore away the cheap and temporary affair built to comply with the law under compulsion, and has erected in its place a substantial ladder that will last for years."

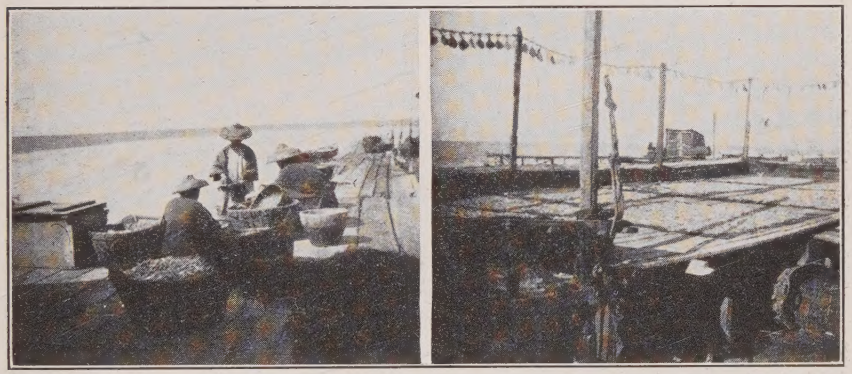

FIG. 30. Chinese shrimp fishermen and small fish, caught in the shrimp nets, being dried. The danger to young fish as a result of the shrimp fisheries early became an important problem of the Fish and Game Commission. Photographs by N. B. Scofield.

The most important problem confronting the Commission in the years 1876 and 1877 was the decreasing run of salmon in the Sacramento and San Joaquin rivers. A demand for a closed season to limit the catch was made as a result of investigation. Interest in the salmon situation continued for several years and statistics on canning operations and output were secured.

Decimation of immature fish as a result of the practices of the Chinese shrimp fishermen, and the destruction of the sturgeon by the use of Chinese set lines next attracted the attention of the Commission and in 1885 a strengthening of the patrol service was ordered as was also the building of a patrol launch. By this time shad had become so numerous that a repeal of the closed season was recommended. Interest in salmon centered around the complaint that sea lions destroyed large numbers as they entered the Bay, and the building of the first large state salmon hatchery which was located on Hat Creek.

An interesting political situation hindered the work of the Board during the years 1886 and 1888: "The work of the Commission was progressing very satisfactorily, until disturbed by the attempt on your part (the report was made to Hon. R. W. Waterman, then Governor of

the State of California) to reorganize the Commission by placing thereon persons of your own selection. This attempted removal of the members of the Commission (Routier and Harvey) discredited the acts of the Commission, destroyed public confidence in the legality of their official acts, and defeated all efforts to an efficient discharge of their duties. That the legal status of the Board might be determined, Mr. J. D. Redding, who had been appointed by you to succeed Commissioner Routier, obtained the permission of the Attorney General to bring an action in the name of the people to oust Mr. Routier, but after suffering the action to remain in the courts for several months, he caused it to be dismissed. Subsequently, the State Board of Examiners, moved by the clamor of claimants who had furnished supplies, or rendered services to the state, agreed that the question as to who were entitled to act as the

FIG. 31. A view of the Mount Shasta Hatchery taken about the year 1905. There are now six large hatchery buildings on the grounds.

State Board of Fish Commissioners should be submitted to the Attorney General, and that the opinion of that officer should be binding upon the Board of Examiners until overruled by the courts.''*

The licensing of market fishermen as a means of controlling the salmon situation was begun on March 21, 1887.

Although appointed solely in the interest of preserving and increasing a fish supply, the Fish Commission early recognized the need for conserving game, notably deer, as is evidenced by the following excerpt:

''We recommend that the killing of deer be prohibited absolutely for the next two years, and also the having in possession of the skin of any deer for the same time. This is rendered necessary because of the great

*Biennial Report of the State Board of Fish Commissioners of the State of California, for the years 1886–1888.

loss of these animals during the extremely severe weather of the last two winters, as well as their indiscriminate slaughter in some localities by hunters who defy the law with impunity. With these men, nothing save the heavy hand of the law can be made effective." (Biennial Report 1888–1890.)

An appropriation of $2,000 first gave the impetus to the introduction of foreign game birds. In 1889 attempts were made to secure Oregon pheasants but actual stocking of the state did not begin until several years later.

The screening of irrigation ditches now attracted attention for the first time and steps were taken to improve the existing situation. It was at this time also that various conflicting county laws relative to the mesh of salmon nets made the enforcement of the salmon laws very difficult.

The sale of fish and game in San Francisco during the closed season became an important problem in the years 1891 and 1892. Under a system of cold storage it was possible for markets to hold fish and game, taken at a time when it was lawful, and to sell it during the closed season. It became apparent that unless some limitations were imposed the closed seasons for fish and game would cease to accomplish any purpose, and recommendations were made accordingly. Demand was also made for an investigation of the marine fishes and the spawning and hatching of the same.

By 1893, with an appropriation of about $20,000 and an income from fishermen's licenses of about $4,000, the Commission was able to employ an attorney, and twenty-seven deputies who served without pay. Furthermore, the first compilation of the game laws of the state was made and printed. Sportsmen's clubs which had by this time begun to appear were encouraged.

Of particular interest were the game statistics secured and published in the 1895–1896 Biennial Report. A table shows the receipts of game birds in the San Francisco and Los Angeles markets. The totals show 332,630 pounds of ducks, 175,444 pounds of geese and 37,880 pounds of California doves, pigeons and other game birds. The total valuation of the birds in the San Francisco and Los Angeles markets was $62,362.01.

In 1897, attention was again directed toward the introduction of ring-necked pheasants and 323 were purchased in Oregon and liberated in five-pair lots. Satisfactory increase was reported. A year or two later about 250 more pheasants were purchased in Hongkong for seventy-five cents each and liberated in several different places in the state.

Interest in commercial fisheries now developed to such a point that there was urgent demand for the abatement of the destruction to young fish by Chinese shrimp fishermen on which agitation had begun as early as 1885. This came as a result of investigations made by an expert which consumed several months' time. Statistics showing the amounts of the different varieties of fish sold in the San Francisco markets were prepared in order to show the need for protective legislation. The sturgeon, once of no market value, was found to be the highest priced fish on the market and with the supply insufficient to meet the demands, in spite of protective laws.

"As the hunting license law produced ample funds, and believing that the establishment of a State Game Farm where game birds could

be raised in captivity and operated along the same lines as fish hatcheries, would be in entire accord with the spirit of the law, which authorizes expenditures for the propagation and restoration of game, and being encouraged by the example of other states, it was decided to undertake the establishment of one in California. Negotiations for services were entered into with several men who had had experience on game farms in eastern states, also with Mr. J. R. Argabrite, a resident of California, who was a successful raiser of pheasants in Ventura County. This resulted in engaging the services of Mr. Argabrite in September, 1908. He was immediately detailed to examine and report on a number of different locations that had been offered for the estab-

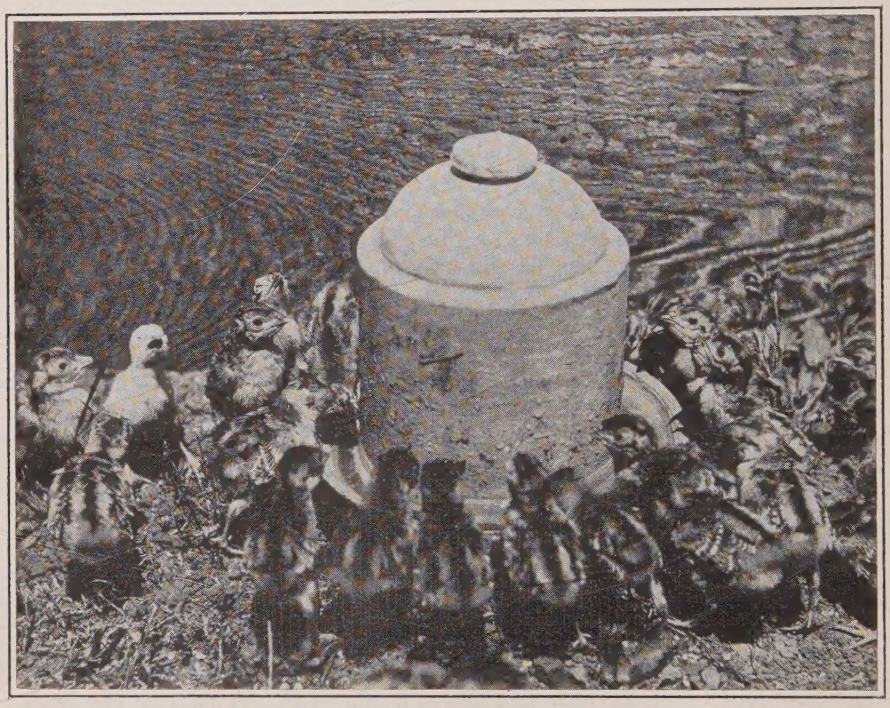

FIG. 32. Pheasant chicks at the State Game Farm. Many pheasants and quail were reared on the farm between 1908 and 1918. Photograph by H. C. Bryant.

lishment of such an institution." (Bienn. Rpt. 1910.) A location was finally selected one mile south of Hayward, Alameda County, and a lease executed in November, 1908. A stock of pheasants was immediately secured together with four dozen Hungarian partridges. During the ten years of its existence the game farm reared and distributed several thousand pheasants, many quail and some wild turkeys. The expense of the farm seemed to be so out of proportion to the results obtained and the location so unfavorable for game propagation that the farm was finally abandoned in the fall of 1918. In the last years of its existence it was used more largely as an experiment station to determine the possibility of breeding different species of game birds and mammals.

When the game farm was first established there were a number of experiments made in the transplanting of native species. In 1908 and 1909, about three thousand quail were trapped and distributed in various sections of the state. About one thousand five hundred of this number were quail trapped in Lower California and liberated near Los Angeles. The incentive for these plants had its source in the mistaken idea that quail were decreasing because of inbreeding.

During the period 1910–1912, due to the concerted effort of Commissioner Newbert, public interest in fish and game conservation was aroused by directing and otherwise aiding in the formation of a representative protective organization, with a membership of over 16,000 sportsmen scattered through every county in the state. Each county sent representatives to Sacramento in order to aid in the formulation of the game laws so that the laws would be as fair to the people of the state as it was possible to make them. The organization, however, was short lived.

In 1912, Charles L. Gilmore was appointed by the Commission to make a stream survey, all of the available data to be recorded on maps together with fish distribution in proper position with reference to the locality of the actual plant. The best available sources of information and of statistical data were consulted and an intensive study made.

Beginning in 1913, the Fish and Game Commission started emphasizing scientific investigation of the many problems relating to fish and game. For these investigations experts from the State University and from Stanford University were secured. Professor Charles H. Gilbert undertook an inquiry into the life history of salmon and trout. Study of the life, abundance and conditions most favorable to the maintenance of our edible crabs was undertaken by Professor Frank W. Weymouth. A study of the clams of California was made by Harold Heath and one on abalones by Chas. L. Edwards. Complaint of the devastation caused by meadowlarks and other nongame birds led to the study of the relation of birds to agriculture by H. C. Bryant. At this time also, Miss Gretchen Libby was secured to conduct an educational campaign regarding wild life and wild life conservation in the schools of the state. Frank C. Clarke undertook an investigation of the deer problem and published a report.

On August 10, 1913, the employees of the Commission were included in the classified list of state employees under civil service. In this year also administrative divisions were established under the charge of branch offices at Sacramento, Los Angeles and Fresno.

Beginning in 1914, emphasis was placed on education and publicity, a separate department being inaugurated. Conservation work in the schools and in the summer resorts was undertaken, as well as the publication of a quarterly, CALIFORNIA FISH AND GAME, with the motto, "Conservation Through Education."

In 1917, in anticipation of an income from a newly established fisheries tax, scientific investigation of problems connected with the rapidly growing fisheries of the state were begun with the ultimate establishment of a State Fisheries Laboratory at San Pedro under the direction of Mr. W. F. Thompson. A patrol boat suitable for use in scientific work was built in 1918. A system of recording the catch of fish in order to furnish statistics of fluctuation and overfishing was also begun.

The game refuge as a means of game conservation came to the fore about 1909 but it was 1915 before extensive areas were set aside. In 1917, sixteen large areas were added making a total when the national parks and monuments are added of about 3,000,000 acres.

FIG. 33. The old Tahoe Hatchery as it appeared in 1906.

FIG. 34. The new Tahoe Hatchery completed August, 1920. Photograph by M. K. Spaulding.

In 1920, the Commission was operating sixteen fish hatcheries and six egg-collecting stations. The output in trout for the two-year period ending June 30, 1920, amounted to 34,000,000. In addition 29,000,000 Chinook salmon were hatched and distributed. Thus we find at the end of the fifty-year period that continued emphasis is being placed on fish propagation with attendant spectacular results.

PERSONNEL.

A succession of interested and discerning commissioners backed by a long list of faithful employees have combined to make a splendid working organization. The policy pursued by each newly appointed Commission of retaining employees instead of using political power to oust them has allowed certain policies to be continued through a term of years, without change and with correspondingly favorable results. The present head of the Fisheulture Department, W. H. Shebley, and his assistant, E. W. Hunt, have served the Commisison continuously for thirty-five and thirty-two years respectively. The list of chief deputies and executive officers is very short considering the political changes during fifty years. The list on page 84 will furnish some idea of the men appointed by various Governors, as Fish and Game Commissioners.

Chief Deputies and Executive Officers.

John P. Babcock----December, 1892–October 15, 1901
Chas. A. Vogelsang----October 15, 1901–August 15, 1910
John P. Babcock----August 15, 1910–November 29, 1911
Ernest Schaeffle----November 29, 1911–September, 1916
Carl Westerfeld----December 8, 1916–April 28, 1920
Chas. A. Vogelsang----April 28, 1920—

CONSTRUCTIVE LEGISLATION AND COURT DECISIONS.

A number of court decisions have formed the ground work for the successful administration of fish and game laws, not only in California but in other states. The more outstanding cases have had to do with pollution, transportation and sale of fish and game. Brief statements regarding the more important ones follow:

It was in 1893 that the Supreme Court handed down a very important decision relative to the sale of venison. In the case of Simon Maier, the law making the possession of venison illegal during the closed season was upheld even though the deer might have been killed without the state.

Hide hunters were most active about 1880 when thousands of deer hides were shipped annually from Sacramento Valley towns, but a final cleanup of offenders did not come until 1893, when arrests were made in San Francisco and an important case won. Thereafter, violations of the deer law were less flagrant.

Several important game cases helped put a stop to illegal sale of game in the markets. A test case of the law fixing a limit on the number of quail, ducks, doves and other game birds that one person may possess during one calendar day was decided in favor of the people, and market men of San Francisco were forced to limit their supply to a single bag limit. Similar cases carried to the Supreme Court were decided favorably. Also the law prohibiting the sale of quail was upheld in the Supreme Court. Inspection of express shipments was begun in an effort to stop illicit shipping of game.

LIST OF FISH AND GAME COMMISSIONERS, 1870–1920.

Commissioner	Term of office	Home	Occupation	Recreation	Attainments in office
n. B. B. Redding	1870–1885	San Francisco	Lawyer	Angler	Introduction of fishes; striped bass.
on. S. R. Throckmorton	1870–1885	Sausalito	Capitalist	Naturalist	Introduction of fishes.
on. J. D. Farwell	1870–1885	San Francisco	Capitalist	Angler and sportsman	Introduction of fishes.
n. R. H. Buckingham	1885–1886	Broderick	Market fisherman; hotel man	Commercial fishing	Introduced carp.
n. A. B. Dibble	1885–1886	Grass Valley	Lawyer	All round sportsman	Restocking depleted streams.
n. T. J. Sherwood	1885–1886	Marysville	Newspaper man	Field sportsman	Developed interest in fish and game.
n. Joseph Routier	1886–1891	Routier	Fruit grower	Conservationist and field sportsman	Motto: "More fish"; conservation of game.
n. J. Downey Harvey	1886–1891	Los Angeles	Capitalist	All round sportsman	
n. Charles Josselyn	1886–1891	San Francisco	Ship chandler	Angler and sportsman	Propagation.
n. Joseph D. Redding	1891–Feb. 25, 1895	San Francisco	Lawyer	Angler and sportsman	Propagation.
n. Ramon E. Wilson	1891–Sept. 22, 1891	Napa	Lawyer	Angler and sportsman	Propagation.
n. Joseph Morizio	1891–Dec., 1892	Oakland	Commercial fisherman	All round sportsman	Commercial fisheries; propagation.
n. Hugh L. Macneil	Nov., 1892–Jan., 1895	Los Angeles	Capitalist; fruit grower		
n. William C. Murdock	Dec. 22, 1892–Sept., 1896	San Francisco	Capitalist	Sportsman and angler	Authority on fish and game.
n. H. F. Emeric	Feb.8, 1895–Sept., 1897	San Francisco	Rancher	Angler	Originated the "Emeric spinner."
n. J. M. Morrison	Mar. 12, 1895–Jun, 1899	Sacramento	Restaurant man	Trap shooter	County game warden law; law enforcement; introduction of game.
n. Alex. T. Vogelsang	Nov., 1896–April, 1901	San Francisco	Lawyer	Angler	Propagation of salmon and trout.
n. C. B. Gould	Sept., 1897–April, 1901	Oakland	Business man	Angler and sportsman	Fish propagation.
n. Henry W. Keller	June 20, 1899–April 24, 1903	Santa Monica	Capitalist	Sportsman	Conservation; urged bag limits and non-sale of game.
n. W. W. Van Arsdale	April 5, 1901–May, 1907	Ridgewood	Rancher; lumberman	Sportsman	Conservation.
n. W. E. Gerber	April 5, 1901–May, 1907	Sacramento	Rancher; banker	Trap shooter; sportsman	Introduction of game.
n. John Bermingham, Jr.	Mar. 23, 1905–July, 1908	Pinole	Superintendent powder works	Bass angler	Fish propagation and fish patrol.
n. George Stone	May 14, 1907–May, 1910	San Francisco	Capitalist		
n. F. W. Van Sicklen	June 25, 1907–Nov. 3, 1910	Alameda	Business man	Angler and sportsman	Game propagation and game farm.
n. M. J. Connell	July 15, 1908	Los Angeles	Capitalist	Angler and sportsman	Golden trout propagation and distribution.
n. Lendal N. Gray	Nov. 3,1910–Dec., 1910 Deceased	San Mateo	Shipping man	Angler and sportsman	
n. David Starr Jordan	Nov. 4, 1910–Aug. 4, 1911	Stanford University	College president	Ichthyologist	Conservation.
n. F. G. Sanborn	Jan. 21, 1911–Jan. 2, 1912	San Francisco	Business man	Angler	Fish and game propagation.
n. F. M. Newbert	Aug. 4, 1911	Sacramento	Merchant	Trap shooter; sportsman	Fish propagation; game protective association; untrammeled fishing rights.
n. Carl Westerfeld	Jan. 2, 1912–Dec. 8, 1916	San Francisco	Lawyer	Sportsman	Law enforcement; educational work.
n. E. L. Bosqui	Dec. 8, 1916	San Francisco	Printer	Angler	Commercial fisheries.

For several years the desire to curb the use of explosives in the capture of fish led to the offer of a reward of $25 for the arrest of any person killing fish by the use of powder or dynamite. For the two years ending September 1, 1898, nineteen cases where explosives had been used were prosecuted.

Owing to the efforts of the Commission a hunting license law was enacted in 1907, but the angler's license law was not enacted until 1913. The hunting license law met the approval of all those interested in the preservation of game and provided funds for a $20 bounty on mountain lions, after November, 1907.

In 1897, a case of importance which was brought before the courts was that against the Truckee Lumber Company for dumping sawdust in the Truckee River. The company maintained that the state had a right to protect fish only in navigable waters and that in all other waters the right is exclusively in the riparian proprietor. The Supreme Court ruled that the right to take fish extends to all waters and that therefore the title remains in the government. Also that the waters of the state furnish passageway for the fish and that they can not be subjected to private ownership. Further that the owner does not control all of the fish in the stream except as he reduces them to actual possession and that he can not kill or obstruct the free passage of those not taken.

Proper control of the transportation of game was attained by winning two important cases, one of which put the game transfer companies out of business and the other sustained the law prohibiting the use of parcel post in the shipment of game.

"For a number of years prior to 1913, there was an organized effort on the part of certain commission merchants in San Francisco to evade the limit law on ducks and to that end transfer companies were formed, which, while endeavoring to act as such, were, in fact, subterfuges of the several commission houses; for the reason that a transfer company is allowed to have in its possession more than the limit of ducks in one day, for the purpose of transportation only. When the Commission discovered this fact, all the ducks in the possession of the so-called transfer companies were seized. Thereafter, an action was brought in the Superior Court to restrain the Commission from seizing the ducks, so shipped, and for $5,000 damages. Judgment was rendered in favor of the Commission and against the plaintiff, for costs. Since the rendering of this decree, these so-called transfer companies have entirely gone out of business and it has reduced the unlawful distribution of ducks to less than one-half." (Bienn. Rept. 1914.)

The first legislation regarding the nonsale of game was brought before the people of California in 1893, when the market sale of deer was prohibited. In 1901, quail were taken from the market. But a crisis was reached when, in 1913, along with many other bills relating to fish and game, there was introduced into the legislature what has since been known as the "Flint-Cary bill," prohibiting the sale of wild ducks and wild pigeons, in addition to the wild game the sale of which had been previously forbidden.

This bill was passed by both houses and signed by the Governor, but those who had failed to prevent its passage, namely, the Northern California Hotel Men's Association and others, got up a referendum petition, which led to the setting aside of the bill until the general election, November 3, 1914. The law failed of passage in the November election, but a few years afterwards the federal law was passed which prohibits the market sale of any migratory game which accomplished the desired result.

In July 1914, on account of the decision that the Districting Act of 1913 was faulty, it became necessary to revise the act and to change many of the laws on the statutes. This was done at the 1915 session of the legislature.

On September 11, 1917, Frank Phoedovius was arrested in San Mateo County for shipping deer meat by parcel post. He was tried and convicted and sentenced to pay a fine of $25 or be imprisoned in the county jail until said sentence was satisfied, in proportion to one day's imprisonment for every dollar of said fine. The fact that the postal laws prevented inspection of any packages shipped by parcel post had been taken advantage of by the market hunters and fishermen. The decision in this case took from them the last avenue through which the game and fish of the state could be unlawfully exploited.

CONCLUSION.

These features of the work of the Commission have been selected more or less at random and doubtless there are many other accomplishments which deserve recognition. Such have been left out for the sake of brevity.

The above achievements have of course been accompanied with many discouragements and some failures, but the latter are overshadowed by these notable successes.

With such achievements as a background the future should yield a rich harvest of new attainments.

PUBLICATIONS OF THE CALIFORNIA FISH AND GAME COMMISSION, 1870-1920.

Compiled by HAROLD C. BRYANT.

INTRODUCTION.

A test of the efficiency of any organization whose function it is to administer natural resources is to be found in the actual published results of scientific research. Certainly, a Fish and Game Commission is not functioning correctly if legislation and current activities are not based on the carefully ascertained facts secured as a result of scientific inquiry. That the California Fish and Game Commission has not been remiss in this regard is evidenced by the following list of publications. Although compiled largely as an aid to those making use of published articles on the fish and game of this state, the list should bring forcefully to the minds of all readers the outstanding features in the work and accomplishments of the Commission during the fifty years of its existence.

The list is as near complete as it was possible to make it. As the files of the Commission were destroyed in the San Francisco fire of 1906, reference has been made to the files of the State Library and the University of California Library, as well as to files of the Fishcultural Department.

All of the publications listed with but one or two exceptions have been published by the State Department of Printing at Sacramento.

In some instances new series of bulletins have been started under different administrations without due regard to previous series. These have accordingly been designated as new series, to avoid duplication of bulletin numbers, although this designation does not appear on the bulletins themselves.

The serial publications of the Commission have been: (1) biennial reports (a report to the Governor required by law); (2) California fish and game laws (a compilation of the laws relating to fish and game for the use of deputies); (3) abstracts of California fish and game laws (cards giving a summary of the open seasons, bag limits and other regulations); (4) fish bulletins (publications giving the results of scientific investigations); (5) game bulletins (publications giving the results of scientific investigations); (6) teachers' bulletins (a series designed for the use of teachers in the public schools); (7) miscellaneous bulletins (miscellaneous reports on the work and accomplishments of the Commission and publications appearing irregularly); (8) CALIFORNIA FISH AND GAME (a quarterly magazine with the motto "Conservation Through Education"); (9) reprints and separates.

BIENNIAL REPORTS.

Report of the Commissioners of Fisheries of the State of California for the years 1870 and 1871. 1872; 24 pp.

Report of the Commissioners of Fisheries of the State of California for the years 1872 and 1873. 1874; 28 pp.

Report of the Commissioners of Fisheries of the State of California for the years 1874 and 1875. 1875; 36 pp.

Report of the Commissioners of Fisheries of the State of California for the years 1876 and 1877. 1877; 30 pp.

Report of the Commissioners of Fisheries of the State of California for the years 1878 and 1879. 1879; 63 pp.

a. Report upon the food fishes of San Francisco. By W. N. Lockington, pp. 17–58.

Report of the Commissioners of Fisheries of the State of California for the year 1880. 1880; 70 pp.

a. Report on the edible fishes of the Pacific Coast, U. S. A. By W. N. Lockington, pp. 16–66.

Biennial Report of the Commissioners of Fisheries of the State of California for 1881–1882. 1882; 23 pp.

Biennial Report of the Commissioners of Fisheries of the State of California for the years 1883–1884. 1884; 33 pp.

Biennial Report of the Commissioners of Fisheries of the State of California for the years 1885–1886. 1886; 31 pp.

Biennial Report of the State Board of Fish Commissioners of the State of California for the years 1886–1888. 1888; 15 pp.

Biennial Report of the State Board of Fish Commissioners of the State of California for the years 1888–1890. 1890; 67 pp. 4 pls.

a. Food fishes of the California fresh waters. By Carl H. Eigenmann, pp. 53–65.

b. Why salmon are scarce. By H. W. Harkness, pp. 66–67.

Biennial Report of the State Board of Fish Commissioners of the State of California, 1891–1892. 1892; 65 pp., 3 pl.

a. Salmon and trout of the Pacific Coast. By David Starr Jordan, pp. 44–58.

b. Description of a new species of trout (Salmo kamloops). By David Starr Jordan, pp. 60–61, 1 pl.

c. Description of the Golden trout of Kern River. By David Starr Jordan, pp. 62–65, 1 pl.

Thirteenth Biennial Report of the State Board of Fish Commissioners of the State of California, 1893–1894. 1894; 143 pp., 18 pl.

a. Report of observations respecting the oyster resources and oyster fishery of the Pacific Coast of the United States. By Charles H. Townsend, pp. 92–108.

b. Salmon and trout of the Pacific Coast. By David Starr Jordan, pp. 125–141, 7 pls.

c. Descriptions of new varieties of trout. By David Starr Jordan, pp. 142–143, 3 pls.

Fourteenth Biennial Report of the State Board of Fish Commissioners of the State of California, for the years 1895–1896. 1896; 108 pp., 28 pl.

Fifteenth Biennial Report of the State Board of Fish Commissioners of the State of California, for the years 1897–1898. 1900; 75 pp., 3 pls., 3 figs.

a. Report on the planting of quinnat salmon fry in the short coast streams of Marin County, California. By N. B. Scofield, pp.49–62, 3 pls.

b. Notes on the movements of the young of the steelhead trout in Marin County streams. By N. B. Scofield, pp. 63–65.

c. Notes on an investigation of the movement and rate of growth of the quinnat salmon fry in the Sacramento River. By N. B. Scofield, pp. 66–71.

Sixteenth Biennial Report of the State Board of Fish Commissioners of the State of California, for the years 1899–1900. 1900; 45 pp.

Seventeenth Biennial Report of the State Board of Fish Commissioners of the State of California, for the years 1901–1902. 1902; 76 pp., 3 pls., 7 figs.

a. The equity of the game laws. By a "convert," pp. 58–63.

b. Studies in the natural history of the Sacramento salmon. By Cloudsley Rutter, pp. 64–76, 1 pl.

Eighteenth Biennial Report of the State Board of Fish Commissioners of the State of California, for the years 1903–1904. 1904; 112 pp., 16 figs.

a. Pacific species of salmon and trout. By David Starr Jordan, pp. 75–97.

b. The parent-stream theory of the return of salmon. By David Starr Jordan, pp. 98–102.

c. Artificial propagation of salmon in the Sacramento River. By Cloudsley Rutter, with addenda by Commissioners, pp. 103–107, 1 fig.

Nineteenth Biennial Report of the State Board of Fish Commissioners of the State of California for the years 1904–1906. 1907; 112 pp., 3 colored pls., 29 figs.

a. The trout and salmon of the Pacific Coast. By David Starr Jordan, pp. 77–92, 11 figs.

b. Do quinnat salmon return to the native streams? By Cloudsley Rutter, pp. 93–97.

c. The golden trout of the southern High Sierras. By Barton Warren Evermann, pp. 98–112, 1 pl.

Twentieth Biennial Report and Financial Statement of the State Board of Fish Commissioners for the years 1907–1908. (Not printed for distribution but appearing in the Appendix of the Twenty-first Biennial Report, pp. 75–79.)

*Twenty-first Biennial Report of the Board of Fish Commissioners of the State of California, for the years 1909–1910. 1910; 127 pp., 8 colored pls., 16 figs.

a. Notes on the striped bass in California. By N. B. Scofield, pp. 104–109, 1 pl.

b. Notes on spawning and hatching of striped bass eggs at Bouldin Island Hatchery. By N. B. Scofield and G. A. Coleman, pp. 109–117, 3 figs.

c. Pheasant raising. By Chas. A. Vogelsang, pp. 118–124, 1 pl., 1 fig.

d. Diseases of pheasants. By George B. Morse, M.D., V.S., pp. 124–127.

*Twenty-second Biennial Report of the Fish and Game Commission of the State of California, for the years 1910–1912. 1913; 80 pp., 5 figs.

*Twenty-third Biennial Report of the Fish and Game Commission of the State of California, for the years 1912–1914. 1914; 166 pp., 34 figs.

a. Arid California and its animal life. By Frank Stevens, pp. 127–135, 2 figs.

b. The California fish industry from a commercial point of view. By F. E. Booth, pp. 136–140, 1 fig.

c. The National Forests in California. By W. C. Hodge, pp. 141–150, 3 figs.

d. The American army of hunters. By Ernest Schaeffle, pp. 151–152.

NOTE.—Beginning with the Twenty-fourth, the Biennial Report consists of the report only, such papers as had been included heretofore being henceforth published as bulletins or in the quarterly CALIFORNIA FISH AND GAME.

*Twenty-fourth Biennial Report of the Fish and Game Commission of the State of California, for the years 1914–1916; 248 pp., 88 figs., 1 colored pl.

*Twenty-fifth Biennial Report of the Fish and Game Commission of the State of California, for the years 1916–1918; 98 pp., 11 figs.

*Twenty-sixth Biennial Report of the Fish and Game Commission of the State of California, for the years 1918–1920. 1921; 149 pp., 28 figs.

CALIFORNIA FISH AND GAME LAWS.

1885 The Fish and Game laws of the State of California; published by authority of the State Board of Fish Commissioners; 1st ed., 77 pp.

1886 (No record available of 2d edition.)

1887 The Fish and Game laws of the State of California; published by authority of the State Board of Fish Commissioners; 3d ed., 80 pp.

1889 The Fish and Game laws of the State of California; published by authority of the State Board of Fish Commissioners; 4th ed., 86 pp.

*Publications still available for distribution are marked with an asterisk.

1891 The Fish and Game laws of the State of California; published by authority of the State Board of Fish Commissioners; 5th ed., 84 pp.
1893 The Fish and Game laws of the State of California; published by authority of the State Board of Fish Commissioners, compiled by F. P. Deering, attorney for the Board; 6th ed., 142 pp.
1895 The Fish and Game laws of the State of California; published by authority of the State Board of Fish Commissioners, compiled by Arthur G. Fletcher, clerk of the Board; 7th ed., 55 pp.
1897 The Fish and Game laws of the State of California; published by authority of the State Board of Fish Commissioners, compiled by Arthur G. Fletcher, clerk of the Board; 8th ed., 55 pp.
1899 The Fish and Game laws of the State of California; published by authority of the State Board of Fish Commissioners; 9th ed., 32 pp.
1901 The Fish and Game laws of the State of California; published by authority of the State Board of Fish Commissioners; 10th ed., 48 pp.
1903 The Fish and Game laws of the State of California; published by authority of the State Board of Fish Commissioners, compiled by Chas. A. Vogelsang; 11th ed., 48 pp.
1905 The Fish and Game laws of the State of California; published by authority of the State Board of Fish Commissioners, compiled by Chas. A. Vogelsang; 12th ed., 52 pp.
1907 The Fish and Game laws of the State of California; published by authority of the State Board of Fish Commissioners, compiled by Chas. A. Vogelsang; 13th ed., 64 pp.
1909 The Fish and Game laws of the State of California; published by authority of the State Board of Fish and Game Commissioners, compiled by Chas. A. Vogelsang; 14th ed., 80 pp.
1911–12 State of California Fish and Game Laws; compiled and published by order of the State Board of Fish and Game Commissioners; 15th ed., 118 pp.
1913–14 State of California Fish and Game Laws; compiled and published by order of the State Board of Fish and Game Commissioners, arranged by Ernest Schaeffle, Assistant Commissioner; 16th ed., 123 pp.
1914–15 State of California Fish and Game Laws; published by the Board of Fish and Game Commissioners, arranged by Ernest Schaeffle, Assistant Commissioner; 17th ed., 130 pp.
1915–17 State of California Fish and Game Laws; published by the Board of Fish and Game Commissioners, arranged by John P. Fisher, game expert; 18th ed., 144 pp.
1915–17 State of California Fish and Game Laws; published by the Board of Fish and Game Commissioners, arranged by John P. Fisher, in charge license department; 19th ed., 144 pp.
1917–19 State of California Laws relating to Fish and Game; published by the Board of Fish and Game Commissioners, arranged by J. S. Hunter, assistant executive officer; 20th ed., 180 pp.
1919–21 *State of California Laws relating to Fish and Game; published by the Board of Fish and Game Commissioners, arranged by J. S. Hunter, assistant executive officer; 21st ed., 201 pp.

ABSTRACT OF FISH AND GAME LAWS.

Abstract of California Fish and Game Laws; first published in 1903 (?); biennially to 1920. (Two sizes, one for mailing, the other as a poster.)
Abstract of Laws pertaining to Commercial Fisheries.
1915–1917.
1917 1919.
1919 1921.

FISH BULLETINS.

1. Report on fish conditions; 1913; 48 pp., 3 figs. Contains:
   a. The abalone industry in California. By Charles Lincoln Edwards.
   b. The towing of salmon and steelhead fry from Sacramento to the sea in a "live car." By N. B. Scofield.
   c. The problem of the spiny lobster. By Bennet M. Allen.
   d. Investigation of the clams of California. By Harold Heath.

*Publications still available for distribution are marked with an asterisk.

e. Investigation of the life history of the edible crab (*Cancer magister*). By F. W. Weymouth.
f. A general report on a quinnat salmon investigation carried on during the spring and summer of 1911. By N. B. Scofield.
g. Trout and black bass planting and transplanting in the San Joaquin and Southern Sierra districts. By. A. D. Ferguson.

2. *The scientific investigation of marine fisheries as related to the work of the Fish and Game Commission in Southern California. By Will F. Thompson. 1919; 27 pp., 4 figs.
3. *The spawning of the grunion (*Leuresthes tenuis*). By Will F. Thompson, assisted by Julia Bell Thompson. July 15, 1919; 29 pp., 9 figs.
4. *The edible clams, mussels and scallops of California. By Frank W. Weymouth. January 10, 1921; 74 pp., 19 pls., 26 figs. (In press.)
5. *A key to the families of marine fishes of the west coast. By Edwin C. Starks. March 3, 1921; 16 pp., 4 figs. (In press.)

GAME BULLETINS.

1. *Report on game conditions; 1913; 67 pp., 8 figs. Contains:
   a. Investigation of the large game situation in California with special reference to deer. By Frank C. Clarke.
   b. Present and future status of the California valley quail. By Harold C. Bryant.
   c. Introduction of foreign game birds into the southern San Joaquin and tributary sections. By A. D. Ferguson.
   d. Educating the young people as to the need and value of wild life conservation. By Gretchen L. Libby.
   e. Investigation of the economic status of nongame birds. By H. C. Bryant.

TEACHERS' BULLETINS.

1. *A few reasons for teaching bird study in the schools. [By Gretchen L. Libby.] 1912; 4 pp.
2. *Birds as rodent destroyers. [By Gretchen L. Libby.] 1912; 4 pp.
3. *Owls. [By Gretchen L. Libby.] 1912; 4 pp.
4. Game conservation and its importance. [By Gretchen L. Libby.] 1913; 4 pp.
5. *Game conservation and its importance. [By Gretchen L. Libby] (continued from No. 4). 1913; 4 pp.
6. *Bats as desirable citizens. By Joseph Grinnell. 1916; 4 pp.
7. *The European house sparrow and its control in California. By Harold C. Bryant. 1916; 8 pp., 6 figs.

GENERAL.

MISCELLANEOUS BULLETINS.

SERIES A.

No. 1. Short report on classification of certain fish found in the Eel River, as steelhead trout, in salt water during month of September. By David Starr Jordan. October 12, 1891.

No. 2. Short report on classification of certain fish found in Webber Lake as *Salmo mykiss henshawi* (cut-throat). By David Starr Jordan. October 12, 1891.

No. 3. Short report on classification of certain fish found in Klamath River as steelhead trout, *Salmo gairdneri*. By David Starr Jordan. October 24, 1891.

No. 4. Salmon and trout of the Pacific Coast. By David Starr Jordan. February 15, 1892; 19 pp.

No. 5. Enforcement of game ordinance of city and county of San Francisco. March 15, 1892.

No. 6. Classification of the trout caught in Mount Whitney Creek. July 12, 1892.

SERIES B.

No. 1. Pheasant raising. By Chas. A. Vogelsang. 1910; 12 pp., 1 fig. Contains also: Diseases of pheasants. By Geo. B. Morse; pp. 9–12.

*Publications still available for distribution are marked with an asterisk.

SERIES C.

No. 1. Statement by Commissioners. 1911; 23 pp. (Relative to activities of the Commission.)
a. Excerpt from report on crab investigation. By F. W. Weymouth.
b. Bird investigation. Letter written by H. C. Bryant to the editor of the San Bernardino "Sun."
No. 2. Bird study in the schools. By Gretchen L. Libby. 1912; 49 pp., 1 fig.

SERIES D.

No. 100. *Deer in relation to young orchards. By A. D. Ferguson: Farmers' Bulletin. January, 1914; 4 pp.

EXTRA SERIES (not numbered).

How to liberate game birds; date (?); 1 p.
Receipts, disbursements and transactions for period from July 1, 1910 to June 30, 1912. December 23, 1912; 4 pp. (printed on one side only).
Statement from the Fish and Game Commission. 1912; 1 p.
*Your Fish and Game—Swat the market hunter and give the boy a chance. 1913 (?); 14 pp. illus.
Statement from the Fish and Game Commission. 1913 (?); 4 pp., 1 map inclosed. (In reference to nonsale of game.)
*Conservation through education. 1915 (?); 14 pp., illustrations in color.

CALIFORNIA FISH AND GAME.

A publication devoted to the conservation of wild life and published quarterly by the California Fish and Game Commission.

VOL. I. 1914–1915.
No. 1. October,.
No. 2. January 30.
No. 3. April 10.
No. 4. July 15.
No. 5. October 15.

VOL. II. 1916.
No. 1. January 15.
No. 2. April 15. (Shad number.)
No. 3. July 24. (Deer number.)
No. 4. October 18.

VOL. III. 1917.
No. 1. January 20.
No. 2. April 15.
No. 3. July 20.
No. 4. October 27.

VOL. IV. 1918.
No. 1. January 28. (Herring number.)
No. 2. April 15.
No. 3. July 15. (Kelp number.)
No. 4. October 25.

VOL. V. 1919.
No. 1. January. (Published February 3, 1919.)
No. 2. April 21.
No. 3. July 15. (Trout number.)
No. 4. October 21.

VOL. VI. 1920.
No. 1. January 15.
No. 2. April 19.
No. 3. July 26.
No. 4. October 28.

REPRINTS AND SEPARATES—CALIFORNIA FISH AND GAME.

VOL. I.

No. 1. *Bird life as a community asset. By Joseph Grinnell. October, 1914; 3 pp.
No. 2. *The wood duck in California. By Joseph Grinnell and H. C. Bryant. January 30, 1915; 4 pp.
No. 3. *The Tennessee possum has arrived in California. By Joseph Grinnell. April 10, 1915; 3 pp., 1 fig.
No. 3. *An attempt to save California elk. By B. W. Evermann. April 10, 1915; 11 pp., 8 figs.
No. 3. *California's fur-bearing mammals. By Harold C. Bryant. April 10, 1915; 12 pp., 2 figs.
No. 4. *Books and pamphlets relating to California birds. By H. C. Bryant. July 15, 1915; 3 pp.
No. 4. *Two kinds of conservationists. By W. P. Taylor. July 15, 1915; 3 pp.
No. 5. *Some hints on making photographs for illustrations. By Tracy I. Storer. October 15, 1915; 4 pp.

*Publications still available for distribution are marked with an asterisk.

VOL. II.

No. 1. *Science and progress in the protection of forest, fish and game animals. By Chas. C. Adams. January 15, 1916; 4 pp.
No. 2. *The California valley elk. By B. W. Evermann. April 15, 1916; 8 pp., 1 fig.
No. 2. *Does the grizzly bear still exist in California? By Joseph Dixon. April 15, 1916; 5 pp., 4 figs.
No. 3. *The timber wolf in California. By Joseph Dixon. July 24, 1916; 3 pp., 3 figs.
No. 4. *A possible enemy of the mosquito. By Clarence Hamilton Kennedy. October 18, 1916; 4 pp., 4 figs.

VOL. III.

No. 1. *Scientific nature study in the public schools. By Georgie V. Miller. January 20, 1917; 3 pp.
No. 1. *History of the introduction of food and game fishes into the waters of California. By W. H. Shebley. January 20, 1917; 10 pp., 2 figs.
No. 3. *Devilfish and squid. By Harold Heath. July 20, 1917; 6 pp., 4 figs.
No. 4. The sharks of California. By E. C. Starks. October 27, 1917; 8 pp., 13 figs.
No. 4. *Temperature and the albacore. By W. F. Thompson. October 27, 1917; 7 pp.

VOL. IV.

No. 1. *The skates and rays of California, with an account of the rat fish. By E. C. Starks. January 28, 1918; 15 pp., 18 figs.
No. 2. *The herrings and herring-like fishes of California. By Edwin C. Starks. April 15, 1918; 8 pp., 9 figs.
No. 3. *The mackerel and mackerel-like fishes of California. By E. C. Starks. July 15, 1918; 13 pp., 12 figs.
No. 3. *The mussels of the Pacific Coast. By Edward P. Rankin. July 15, 1918; 5 pp., 4 figs.
No. 3. *Discretionary powers and game conservation. By Harold C. Bryant. July 15, 1918; 5 pp.
No. 4. *The flat fishes of California. By Edwin C. Starks. October 25, 1918; 19 pp., 22 figs.

VOL. V.

No. 1. *Shrimp fisheries of California. By N. B. Scofield. February 3, 1919; 12 pp., 5 figs.
No. 1. *The fishes of the croaker family (*Scianenidæ*) of California. By E. C. Starks. February 3, 1919; 8 pp., 8 figs.
No. 2. *The basses and bass-like fishes of California (families *Serranidæ*, *Hæmulidæ* and *Kyphosidæ*). By E. C. Starks. April 21, 1919; 10 pp., 9 figs.
No. 2. *The conservation of our fisheries. By W. F. Thompson. April 21, 1919; 11 pp., 4 figs.
No. 3. *California trout. By Barton Warren Evermann and Harold C. Bryant. July 15, 1919; 30 pp., 12 figs.
No. 4. *Some notes on dry-fly fishing, No. 1. By R. L. M., California. October 21, 1919; 2 pp.

VOL. VI.

No. 1. *Notes on dry-fly fishing, No. 2. By R. L. M., California. January 15, 1920; 5 pp.
No. 1. *California's game sanctuaries. January 15, 1920; 1 p.
No. 1. *The young of the black sea-bass. By Elmer Higgins. January 15, 1920; 2 pp., 2 figs.
No. 1. *The Pacific edible crab and its near relatives. By Frank Walter Weymouth. January 15, 1920; 3 pp., 4 figs.
No. 1. The proposed investigation of the sardine. By Will F. Thompson. January 15, 1920; 2 pp.
No. 2. *The abalones of northern California. By Will F. Thompson. April 19, 1920; 5 pp., 3 figs.
No. 2. *Some notes on dry-fly fishing, No. 3. By R. L. M. April 19, 1920; 10 pp., 4 figs.
No. 3. *Notes on dry-fly fishing, No. 3. By R. L. M. July 26, 1920; 10 pp., 4 figs.
No. 4. *Notes on dry-fly fishing, No. 5. By R. L. M. October 28, 1920; 8 pp., 3 figs.

*Publications still available for distribution are marked with an asterisk.

REPRINTS—BIENNIAL REPORTS.

*Report of Superintendent of Game Farm. By W. N. Dirks; 12 pp., 2 figs. (From Biennial Report of 1914.)
Arid California and its animal life. By Frank Stephens; 9 pp., 2 figs. (From Biennial Report of 1914.)
The California fish industry from a commercial point of view. By F. E. Booth; 5 pp. (From Biennial Report of 1914.)
The national forests in California. By W. C. Hodge; 8 pp., 4 figs. (From Biennial Report of 1914.)

REPRINTS—GAME BULLETINS.

*Investigation of the economic status of nongame birds. By H. C. Bryant. 1912; 19 pp., 8 figs. (Reprint from Game Bull. No. 1.)

SEPARATES—CALIFORNIA FISH AND GAME LAWS.

*Act authorizing and regulating rearing and selling of domesticated fish. (Enacted 1911.) (Separate California Game Laws 1911–13, pp. 75–80.)
*Bowman Law (game farming). (Enacted 1913.) (Separate from California game laws 1913–1915, pp. 67–73.)

FINDING LIST OF SUBJECTS.

Abbreviations used:
B—Biennial Report.
F B—Fish Bulletin.
G B—Game Bulletin.
T B—Teachers' Bulletin.
M B—Miscellaneous Bulletin (A, B, C, D, E series).
R—Reprint, California Fish and Game.
R B—Reprint, Biennial Report.
R G B—Reprint, Game Bulletin.
L—Laws.
M—Maps.
C F and G—California Fish and Game.
S—Separate.

A

Abalone, industry of California—F B 1
of northern California—R VI 2
Albacore, temperature and the—R III 4
Animal life of arid California—B 1912 14; R B 1912 14

B

Bass, and bass-like fishes of California—R V 2
Black, planting and transplanting in San Joaquin and southern Sierra districts—F B 1
Sea, black, young of—R VI 1
Striped, in California—B 1909–10
notes on spawning and hatching of—B 1909–10
Bat, as desirable citizens—T B 6
Bear, does the grizzly still exist in California—R II 2
Bird, as rodent destroyers—T B 2
books and pamphlets relating to—R I 4
investigation—M B (C) 1
life as a community asset—R I 1
study in the schools—M B (C) 2
a few reasons for teaching, in the schools—T B 1
Game, how to liberate—M B
introduction of foreign—G B 1
Non-game, investigation of the economic status of—G B 1; R G B 1
Bowman act—S

C

Cancer magister—F B 1
Clam, edible, of California—F B 4
investigation of—F B 1
Conservation, discretionary powers and game—R IV 3
educating young as to need and value of—G B 1
game, its importance—T B 4; T B 5
of fisheries—R V 2
through education—M B
Conservationist, two kinds—R I 4
Crab, edible, investigation of the life-history of—F B 1
edible, Pacific and its near relatives—R VI 1
excerpt from report on investigation of—M B (C) 1
Croaker family, fishes of—R V 1

*Publications still available for distribution are marked with an asterisk.

D

Deer, investigation of large game situation in California with special reference to G B 1
in relation to young orchards M B (D) 100
Desert life: *see* Animal.
Devilfish and squid R III 3
Discretionary powers: *see* Conservation.
Dry-fly fishing: *see* Fishing.
Duck, wood, in California R I 2

E

Economic status of non-game birds G B 1; R G B 1
Elk, an attempt to save California R I 3
California Valley R II 2

F

Farm, game, report of Superintendent of R B 1912–14
Fish, act authorizing and regulating rearing and selling of domesticated S
a key to the families of marine F B 5
edible, of the Pacific Coast B 1880
food, of California fresh waters B 1888–90
history of introduction of, into California waters R III 1
game, history of introduction of, into California waters R III 1
industry, from a commercial point of view B 1912–14
of Croaker family R V 1
science and progres in protection of R II 1
your, and game M B
flat, of California R IV 4
Rat, an account of R IV 1
Fishery, conservation of R V 2
marine, a scientific investigation of, as related to the work of the Fish and Game Commission F B 2
shrimp, of California R V 1
Fishing, dry-fly R V 4; R VI 1; R VI 2; R VI 3; R VI 4
oyster: *see* Oyster.
Forest, national in California B 1912 14; R B 1912-14
science and progress in protection of fish and game R II 1
Fur-bearing animal: *see* Animal.

G

Game, conservation and its importance T B 1
farm, report of Superintendent of R B 1912–14
farming, Bowman act S
large, situation in California G B 1
laws, equity of B 17; R B 17
non-sale of M B
ordinance, its enforcement in the city and county of San Francisco M B (A) 5
report on conditions of G B 1
sanctuaries, California R VI 1
science and progress in protection of R II 1
your fish and M B
Golden trout: *see* Trout.
Grizzly Bear: *see* Bear.
Grunion, spawning of F B 3

H

Hatching, of striped bass, notes on B 21
Herring, and herring-like fishes R IV 2
Hunter, American army of B 1912–14
market M B

I

Industry, abalone, in California F B 1
fishing, from a commercial point of view B 23
oyster, of Pacific Coast B 13
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L

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NOTE—The last number of each year (October number) of CALIFORNIA FISH AND GAME contains a subject index of all material appearing in that magazine.

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MAPS.

Outline map of California. By Chas. L. Gilmore. 1914.

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Abbreviations used:

B—Biennial Report (up to 1891 designated by year; thereafter by number).
F B—Fish Bulletin.
G B—Game Bulletin.
T B—Teachers' Bulletin.
M B—Miscellaneous Bulletin (A, B, C, D and E series).
R—Reprint, California Fish and Game.
R B—Reprint, Biennial Reports.
R G B—Reprint, Game Bulletin.
L—Laws.
C F and G—California Fish and Game.

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THE CONTROL OF THE MOUNTAIN LION IN CALIFORNIA.

By J. S. Hunter.

The one predatory animal for which practically no good can be said is the mountain lion. This animal without doubt kills more deer in California than are killed by all of the hunters. They also destroy a great many domestic animals. The actual meat value of the game and domestic animals destroyed by lions is impossible to estimate but it is safe to say that it runs into thousands of dollars.

During the many years that the Fish and Game Commission has been paying a bounty for every lion killed, hundreds have been taken, and up to January 1, 1920, $65,550 had been paid out in bounties.

In August, 1917, the amount paid for the killing of a female lion was increased from $20 to $30. Between that date and January, 1920, females to the number of 218 were sent in. Many requests have been made to the Commission that the bounty be still further increased. It is doubtful whether there would be any increase in the number killed even though the bounty were doubled. Most lions are killed either for the sport or on account of their destroying stock. The bounty is not the chief factor, but only an incident. In general as soon as a lion is reported there is a small army of hunters scouring the country, all anxious to boast of having killed a lion.

Contrary to the general opinion lions are not abundant in any part of the state. From the accompanying table it will be noted that Humboldt County leads with a total of 564 killed during twelve years time. The animal has been so reduced in that county that the kill has dropped from 113 in 1908 to 8 in 1919. In Shasta County, the next on the list, the kill has been less than one-half, 261 killed during the same period. Here, however, the animals have apparently not been reduced to the same extent as the kill in 1919 was approximately the same as in 1908.

In Trinity County 260 have been killed; last year only 14 as against 18 in 1908. In Siskiyou County none were killed last year; but in 1908 the number totaled 31 and in the twelve-year period 241. From this it would seem that lions in Siskiyou County are greatly reduced if not practically exterminated. Only one other county, Mendocino, reports more than 200 the first twelve years. In that county 219 have been killed; the number (22) taken in 1919 is just one-half those killed in 1908. Tehama County killed three during 1919, as against 31 in 1908, making a total of 159 in twelve years.

It is evident from the above figures that California lions are being slowly reduced in number and that the animals killed approximately if not entirely exceed the natural increase. If this is true we can form a very good idea as to the number of lions in the state. Forty-two per cent of the lions sent in for bounty are females. The female lion does not bring forth a litter every year but only every other year. Sometimes three kittens are born but the usual number is two. This would make the kill of 243 in 1919 the offspring of 243 females or 42 per cent of the total number of lions in the state. This calculation would give a lion population in California of about 575, which we believe is somewhere near the actual number.

This number of lions can do an enormous amount of damage to the deer. The minimum estimate of the number of deer killed by a single lion each year has been placed at fifty-two. Five hundred seventy-five lions will kill at least 30,000 deer during the year if deer are available and deer are common in every part of the state where lions are found.

The California Fish and Game Commission has determined to make every effort to still further reduce the number of lions. Knowing the increase of hunters and the ease with which hunters can reach what were formerly the most inaccessible places it will be necessary to stop

FIG. 35. Jay Bruce, state lion hunter, and his dogs. The Fish and Game Commission hires Mr. Bruce to cut down the number of mountain lions in the state game refuges.

the heavy natural drain on the deer supply caused by this animal. On this account an expert lion hunter has been employed. This man, Jay C. Bruce, is one of the best lion hunters in the country. In fact, the attention of the Commission was called to Mr. Bruce because of the many lions which he sent in for bounty from Mariposa County.

Mr. Bruce was born in Mariposa County and spent a great deal of his time in the mountains becoming thoroughly familiar with the habits of the animals of the forest. On account of an injury to his left hand

while working in a lumber mill he was forced to secure other employment and turned to that line of work for which his life long training had fitted him. On account of the bounty paid for the killing of lions he devoted considerable time to trailing them with dogs and was very successful.

His success as a lion hunter is due to the fact that he has made a study of the habits of the California lion and knows their habits thoroughly; also to the fact that he is an expert dog trainer and has his dogs trained so that they will follow only the tracks of either a bobcat or a lion and of no other animal. On account of this he can work without difficulty where deer are abundant. These dogs will never take the trail of a deer.

Since Mr. Bruce has been employed by the Commission he has worked chiefly in the game refuges and has made an excellent record. His greatest kill during any one month has been eight lions. Because of the success of the attempt to control the mountain lion it is the intention of the Commission to keep Mr. Bruce employed and later, perhaps, to employ other lion hunters.

Mountain Lion Bounties, 1907 to 1919—By Counties.

County	1907 to 1917	1918	1919	County	1907 to 1917	1918	1919
Humboldt	564	22	8	Santa Clara	19	3	2
Shasta	261	26	30	Colusa	17	3	---
Trinity	260	12	14	Calaveras	13	---	2
Siskiyou	241	1	---	Amador	9	---	---
Mendocino	219	18	22	Orange	9	2	1
Tehama	159	6	3	Plumas	9	---	---
Kern	134	10	15	Stanislaus	9	1	1
Lake	106	11	9	Inyo	7	---	1
Monterey	105	12	19	Lassen	7	---	1
Santa Barbara	99	6	19	Mono	7	---	---
Del Norte	97	2	5	Nevada	7	2	---
Tulare	95	11	17	Sierra	6	---	---
Mariposa	77	12	5	Modoc	4	1	---
San Luis Obispo	76	3	6	Yuba	4	---	1
Tuolumne	75	9	12	Napa	3	---	---
Los Angeles	49	8	9	San Joaquin	2	---	---
El Dorado	48	1	8	Santa Cruz	2	---	1
Glenn	43	3	3	Sutter	2	---	1
San Diego	41	4	5	Alameda	1	---	---
Ventura	40	2	2	Alpine	1	---	---
Madera	39	5	1	Imperial	1	---	---
Placer	37	2	3	Merced	1	---	---
Butte	33	---	2	Sacramento	1	---	1
San Benito	33	2	1	San Mateo	1	---	---
Riverside	29	4	5	Kings	1	---	---
San Bernardino	23	5	3				
Fresno	22	3	4	Totals	3,170	243	214
Sonoma	22	2	1	Grand total	------	------	3,627

HUNTING THE WILD BOAR IN CENTRAL FRANCE.

By W. L. Scofield.

We were at the dinner table when a Frenchman rushed in waving his arms and talking at the top of his voice a stream like a high pressure fire hose. Lunch was finished in an uproar. Finally I found there had been no murder but that a wild boar had been seen at the edge of town. Flambo, the reliable old hunting hound, was out calling on his friends so the gray haired patrone of the hotel stepped to the door and wound several blasts on a cow-horn. Flambo arrived on the lope and I supposed we were ready to start, but not so. We talked about it for another hour and had other glasses of wine all round. By this time other cow-horns were tooting and other mighty hunters arrived at the hotel with shotguns and game bags large enough to carry the tail of a good sized boar.

Finally eight of us were ready to start with seven shotguns, four game bags, one hound and five cow-horns. So we had another glass of wine, talked some more and started for the communal forest about a mile from town. We followed a trail through thick growth along a stream where boars might besport themselves on sunny afternoons, the dog on a string that choked him till his tongue hung out, high tension jabber from all the men and every few minutes some imbecile would let out a blast on his horn for the purpose of adding to the general hilarity and scaring all the game for miles around. Wooden shoes clattered and animated conversation continued till the dog took the trail and then the racket increased instead of subsiding.

We trailed the boar to a thicket and separated to surround him. Guns were unlimbered, conversation increased if possible, the dog was loosed so he could breathe again and chase the boar out of the thicket but we found the boar was not in the thicket. Instead of sitting down and waiting to be surrounded when he heard the uproar the fool boar had wandered off somewhere else so after a half hour's conversation about it we trailed him to the next thicket and repeated the same performance.

This continued all afternoon and furnished ammunition for the most exciting conversation but no boar. I came to realize that conversation was the chief object of the occasion. If we quietly surrounded the boar someone might kill him and then there would be no boar to hunt and talk about another day. My trouble was that I had gone out on a talking expedition without sufficient knowledge of the language so I took a walk alone to look over the country. Toward evening I had no difficulty in finding the hunters for I could hear the din for a couple of miles. We returned to the hotel having been without wine for more than three hours. Half the village gathered in the hotel kitchen to talk about the hunt. At odd times we had some supper and I retired at eleven o'clock with the talk still running at fever heat.

THE ABUNDANCE OF YOUNG PISMO CLAMS.*

By Frank W. Weymouth, Stanford University.

While collecting data for the study of the life history of the Pismo clam some interesting facts regarding the abundance and fluctuations in number of the young have come to light.

During the spring and summer of 1919 the young of the preceding summer (1918) were difficult to obtain. In the fall of 1919 the young of that summer were first observed and have been noted in almost incredible numbers up to the present time. During the present fall (1920) a special search for the young of the current year has been made but only a few specimens have been obtained, indicating an even poorer spawning year than that of 1918.

Before comparing in more detail the relative success of the three spawning seasons it may be well to give some idea of the habits of the young and the methods used in estimating their numbers. The young of the Pismo clam is found for the first three years chiefly between tides where it is easly studied. At low tide on the long Pismo-Oceano beach the firm wet sand which proves so good a road for automobiles is the zone of their greatest abundance and many can be turned up by digging down an inch or so with the fingers. A more striking idea of their numbers may sometimes be gained after an unusually low tide when this area has been left dry for some time. A tiny hole then often appears above the siphon or "neck" of each clam and at times due, apparently, to their movements a little mound is raised above each animal. A view of the beach at such a time is shown in Figure 36 and gives a vivid idea of the abundance of the young clams.

An actual count of the numbers of young clams has been made at intervals in the following way: A shallow trench the width of a clam fork (9½ inches) was dug across the entire wet beach and into the water at low tide (see Fig 37). All the clams found were sorted into age groups, as is easily done by differences of size in the young, and the number of each age counted. They were found chiefly in a narrow zone some 20 to 30 yards wide corresponding to the roughened areas shown in the photograph; above and below this scattering clams were found, but more than nine-tenths of the young were concentrated here. The actual counts made over a period of about a year and a half range from 1294 to 774.

The young spawned in 1919 are, in all collections since their appearance, the most numerous, forming never less than 98 per cent of the total. Those of the previous year (1918) form from 0.88 per cent to 1.32 per cent, while in the two last counts in which the young of the current year (1920) are represented they form only one-fourth of one per cent. Other years, when the young were as abundant as in 1919, are reported by the diggers but seem to come several seasons apart.

The total numbers of young occurring in the entire beach as the result of a successful season such as 1919 is amazing. The productive area of the Pismo-Oceano beach is some eight miles in length; of this the northern third is by far the most thickly populated. The count was not made at the northern end, but near the middle of the beach

*California State Fisheries Laboratory, contribution No. 23.

where the conditions more nearly represent a fair average. A conservative estimate of the total number might be gained by considering six miles of beach with the numbers found in the region examined. Taking an average of the more recent counts when 800 young of 1919 were present in a cross section of the beach 9½ inches wide, a mile would contain 5,150,000 and six miles 30,900,000 clams. Other earlier counts would bring the total to 45,000,000. To this must be added the beach at Morro which, though not examined for this purpose, probably would double the present estimate.

FIG. 36. View taken on Pismo beach at low tide. Note pits and raised areas mentioned in the text; every pit or mound indicates a clam and there are other clams that show neither. Photograph by F. W. Weymouth.

Several important lessons should be drawn from this. When conditions are favorable the young of the Pismo clam are produced and given a foothold in such enormous numbers that the supply of adults should be secure if the young have a fair show. But the "if" should not be forgotten. Large numbers die from natural causes over which we have no control. But there are losses which could be prevented. In order to protect the Pismo clam, laws setting a size limit of 4¾ inches and a bag limit of 36 have been enacted. Many tourists and summer visitors, however, thoughtlessly dig these young that are so easily found

between tides and because they are so small take hundreds to furnish a single meal. The digging of an equal number of those of legal size would violate the bag limit but in realty would do less harm, as most of those which have reached a length of $4\frac{3}{4}$ inches have spawned, thus leaving behind them clams to fill their places. It is unfortunately true that other people including residents with undoubted knowledge of the law also take these young in large numbers. Unless these violations of a wise and necessary law are stopped by the cooperation of all interested people, their disastrous effects must soon be felt. All local residents that value the Pismo clam as a peculiar and distinctive local product should take every means possible to protect the young and to inform tourists and visitors of the need for its protection. With proper protection there is no reason why the Pismo clam should not remain a local

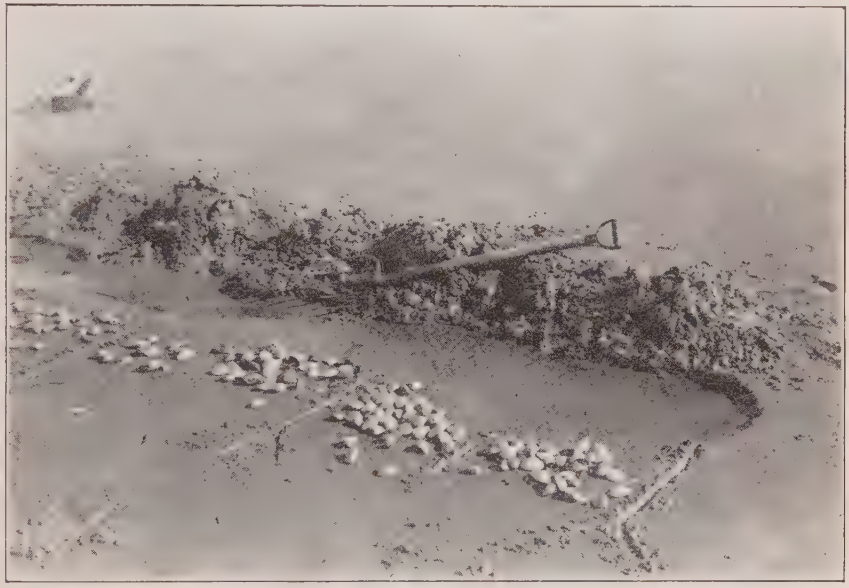

FIG. 37. Portion of trench made in counting young Pismo clams. All the clams shown came from a strip the width of the clam fork shown in the photograph ($9\frac{1}{2}$ inches). Photograph by F. W. Weymouth.

asset—with continued destruction of young before they have spawned as well as the taking of the adults of legal size, it will only be a question of time when this fine clam will be practically exterminated.

Another phase of the scientific work of the Fish and Game Commission is apparent here. The effect of an unusually good spawning year upon a fishery such as the sardine was discussed in the January issue.* Because of the ease with which the young of this clam may be studied we have here an even more striking example of such a successful spawning year in the season of 1919 which exceeds that of 1918 by seventy-five to one hundred times and that of 1920 by about four hundred times. According to reports the last season producing comparable numbers was four or five years ago. Evidently, for a number of years the clams

*See "The Future of the Sardine," by Will F. Thompson, CALIFORNIA FISH AND GAME, Vol. 7, pages 38-41.

spawned in 1919 will form the dominant class and when they reach legal size there will be an unusually good yield of clams. With a complete knowledge of the age reached and the rate of growth of the Pismo clam it would be possible to predict the future yield quite accurately from a yearly examination of the young such as here described.

Present indications are that the effect of this spawning year will be felt in 1925 and 1926, provided that proper protection is afforded the young in the meantime.

QUARTER-OILS OR HALF-POUND OVALS.*

By Will F. Thompson.

(California State Fisheries Laboratory, contribution No. 24.)

One of the great problems which presents itself to the student of fisheries, that of the effect of occasional successful spawning years, was considered in relation to the sardine, in the last issue of California Fish and Game. It was shown that the presence or absence of such great changes can be ascertained, and that such knowledge is most necessary to the proper understanding and prosperity of our greatest fishery. Moreover, the fascinating possibility that such a great change might be prophesied was held forth. In this article another problem, equally great and equally interesting is dealt with, and its close relationship to the great problems of biology is remarked upon.

Our sardine fishery, important as it is, has for the most part arisen within the last few years. At first an adjunct to that very recent one for the albacore, it has now reversed this relationship, and whereas once in Southern California the sardine was canned between albacore seasons, now the albacore and tuna are canned between sardine seasons. Such a limited experience has not until the present brought into question some of the fundamental facts upon which canning operations must rest. One of these is the subject of this paper; namely, the size of sardine which a cannery at Monterey, or a cannery at San Diego may expect to pack in the future. Will it can "quarter-oils," or "half-pound ovals"—the small fish or the large?

Experience thus far seems to indicate that the small fish will predominate to the south, the large fish to the north, that San Diego will be best for "quarter-oils" and Monterey for the larger sizes. This is an important fact—if fact it is—and if brief experience indicates the truth. Such a condition is highly probable, as any fisheries expert should know, for there are several fisheries in which such a distribution of sizes holds permanently. The cousin of the sardine—the Atlantic herring—has just such a distribution in the North Sea and along the Norwegian coast, and the Pacific herring may have the same along our own shores. The albacore of California has a similar difference in size between its southern and northern representatives. Yet we have had such a brief experience with the sardine of our waters that the seeming difference may be due merely to the passing at different times of dominating age classes such as we dealt with in the last article. Not until we know the real cause, or positive facts which will limit our

*"Quarter-oils" are the sardines packed in small square cans in oil. "Half-pound" ovals are the larger size of fish packed in oval cans containing a half pound each.

conjectures, may we be reasonably sure of the truth. So little attention has been given to the basic laws of fishery science that what we have to say about the question is necessarily speculative—but will, we hope, demonstrate the possibilities and the fascination of its solution.

Inevitably the theory most popular and most readily advanced to explain the differences in sizes is that of *migration*. According to this the sardines move towards the north as they grow older, and then the eggs are carried to the south by currents, so that there is a manner of eddy in existence. Perhaps some people would unhesitatingly assert that sardines hatch from the egg near San Diego and reach the State of Washington before they die. The more moderate minded would possibly confine themselves to a migration of the distance between San Diego and San Pedro. But it is worthy of note that either is a pure assumption, which must bear critical examination no matter what the degree of limitation imposed upon the theory.

It presupposes, indeed, that the sardine population is a homogeneous one, necessarily of the same race or breed from north to south. The proof of the existence of peculiarities in the fish from San Diego which are not present in the fish from San Pedro or Monterey, even though these peculiarities are not racial nor inheritable, would decidedly limit the theory of migration, if it did not eliminate it. The existence of such local "races" of herrings has been conclusively shown, to the great damage of the theory in the case, but it persists in modified form—that the herring of each local race migrate in the same way as all were supposed to do. And so it will doubtless be in the case of the sardine, the proof of the existence of local races will simply confine within smaller limits the ever-present theory. Nevertheless, it is of the greatest importance to distinguish local races of the sardine if possible.

But aside from this attempt to confine within logical bounds a theory tending to be adopted in a most unscientific way, there should also be examined certain fundamental facts which may bear on the question. Thus he supposed migration must vary enormously from year to year to account for the great schools which appear off Alaska, if indeed it could be shown that such schools could be drawn from the south without producing there a great temporary lack easily noticeable. And, again, it is an open question whether there is anything approaching the requisite permanent lack of adults in the south or the lack of young in the north. It may be totally unnecessary to postulate a migration, as a matter of fact, for sufficient adults or young may be present everywhere throughout the range of the species. Moreover, when one considers the vast numbers of eggs laid by fishes, like to the seeds of trees, and the few which must come to maturity from all that horde, it would seem perfectly obvious that even a slight difference in the surrounding conditions would cause great changes in the numbers which reach the various sizes, or stages of growth. And in this last possibility, we come to the second—perhaps more logical theory—that differences in proportion of adults and young may be due to the *differences in living conditions.*

For living conditions must play among fish much the same part that they do among the human kind. Scientists have shown that in barbaric races of man the prevalence of disease, hunger, and war tend to reduce

the chances of survival and render the older inhabitants relatively fewer than in quieter communities. So we might expect among fishes, that if other animals preyed on the earlier ages, the proportion of adults would be much reduced. And it is perhaps a significant fact that the sardines farthest south live in waters which are populated with many active and predacious enemies, particularly of the mackerel type, such as the tuna and the albacore. The contrast between north and south is, indeed, obvious to anyone who has fished in both waters. What more natural, then, than the failure of the young fish in southern waters to survive in numbers to adulthood, despite those favorable conditions for hatching the eggs which these waters may afford?

And it is equally logical that in the far north the chances of survival after once hatching are much better. A great percentage may grow to maturity and increase very greatly the numbers of adult fish, and with them the average of the size. Naturalists have often commented on the fact that the species in colder waters although fewer in number each consist of vastly more individuals, than in warmer waters. Perhaps the difference in rate of mortality explains this—certainly it appears to harmonize with conditions in the sardine.

But if the colder northern waters with fewer enemies allow fish to survive after hatching, are the natural conditions as friendly to the floating egg? One might venture to surmise not, judging from what facts are known. For it has been in northern waters that the vast variation in the success of spawning seasons has been noticed. A favorable year may allow myriads of eggs to hatch, while five, ten or more years may elapse without a recurrence of such favorable conditions. So the phenomenon of a dominating year class arises, concerning which we wrote in the last article in CALIFORNIA FISH AND GAME cited above. This phenomenon has been noticed only in northern waters in such species as the herring and the cod. It seems to occur in our northern sardine, as witness the appearance of the great schools in British Columbia during the last few years. So perhaps we may find that the abundance of large sardines in our northern waters depends, first on the only occasional success of a spawning season, and then on the growth of a large part of the resulting young to maturity. Such an hypothesis seems to fit the facts, and explain the sudden great extension to the north of a commercial abundance of sardines.

If, however, we go far enough to the south, say to Monterey, we may find a region where there is both a reasonable chance of spawning successfully, and a comparatively low rate of mortality still. Then—like nations under similar conditions—the average age of the population would be high, and the young somewhat scarce among the many adults. But even there we might find in a modified degree the phenomenon of dominating age classes, making the sardine appear to be smaller or larger in average size at times. So some such conditions may yet be found at Monterey.

Thus this second theory must be borne in mind, that conditions of existence may lead to varying kinds of populations. To the south, as at San Diego, the numerous young fish may find it hard to survive to maturity, to the extreme north the eggs may not develop save under favorable conditions recurring but seldom, and midway the adults may be more abundant because the young are able to survive the less numer-

ous enemies. The hypothesis certainly harmonizes with the facts as we imperfectly know them. Yet other theories may fit these facts nearly as well.

For if surrounding conditions can modify the actual numbers of fish of various sizes, it is equally probable that they can modify their appearance in the commercial catch. There is no greater fallacy extant, it seems to us, than the assumption that the fishermen catch a fair, or even a passably fair, representation of what actually exists in the ocean. It remains to be proved in every case that a fisherman with his gear, or—what is far more dubious—a scientist with his apparatus, can take a fair sample of any species or of any group of species. So for the third theory we may have one that is perhaps somewhat comforting to the commercially interested man: namely, that the *difference in sizes is really an illusion.*

It is common knowledge that in the method of fishing many things vary from day to day. To some fisheries more or less smooth water is necessary for successful operations. Or market conditions may change and shift the demand from one class of fish to another. Or on one part of the coast fish are taken by one method and on another a different one is used, perhaps merely because of the nationality of the fishermen. So, great caution is necessary that careful investigation of the fisherman and his methods is made at the same time that the fish is studied.

These things are comparatively easily discounted, but there is another category of circumstances not as readily investigated, namely, the effect of physical conditions, such as temperature or currents, upon the accessibility of the fish. There may be, for instance, many adult sardines at San Diego, but oceanic conditions may be such that they are simply never seen, never appear to the fishermen. And the great run of large fish in the far north may not be due to the unusual abundance of some year's spawning, but simply to the prevalence of unusual conditions which may serve to bring the fish in. Or an adult fish may react differently to temperature conditions, as is true of the albacore in a certain degree, and the change in temperature, however slight, may have a decisive effect in preventing the appearance of the large fish or of any particular class, save under the most favorable conditions. Or perhaps the varying salinity of the superficial layers of water may have a decisive influence, as is supposed to be the case in some parts of the North Sea. So there are many things which might be surmised to have an effect on the abundance of fish, so many and in truth so obvious, that fishermen are very prone to adopt this theory. Yet it is very easy to underestimate the ability of the fisherman to take the fish, and very easy to overestimate the sensitiveness of the fish to such changes as occur. Careful observation should be able to decide as to the probability of such occurrences as are mentioned in this paragraph, and to test the real presence or absence of the fish.

To the average casual reader these theories must be confusing, and decision between them very difficult. But there is, indeed, every logical reason to believe that the phenomena which must result from any of these possibilities would vary in a manner clearly distinguishing them according to their origin. Thus the appearance of the large fish far to the north may be due to the dominance of one year class

resulting from one spawning, or it may be due to favorable conditions bringing in the schools toward shore. But nothing should be easier to the scientist with a knowledge of methods of reading age from the scales than to decide whether the fish that come in are really made up of one great year class. That is simply an illustration of one of the possible methods of scientific attack, resultant from close observation and knowledge. So many are they that we may reasonably hope to solve most of the tangled problems that lie before us.

These are problems which are not merely of importance commercially but bear intimately on some of the greater problems of biological science. The true distribution of a species, for instance, may be seen to be in question, and the inadequacy of delimiting such distributions from collections of isolated individuals should be plain. We are in truth studying the factors which limit the distribution of a species, a subject still unknown, despite its importance to the student of the origin of species, or the nature of species. There seems to be no more favorable method of approaching these great problems of biology than through the study of the vast mass of data which the commercial fisheries place at our disposal. They are problems which involve a knowledge of great numbers of individuals and of the actual effect which conditions have on those numbers. The study is statistical if you please, is of commercial value, too; but still is scientific, and biological.

WHALES AND SARDINES.

By Will F. Thompson.

It has recently been the writer's fate to meet several times the argument advanced in all seriousness that the killing off of the whales and the albacore leave a surplus of sardines which might as well be used as fertilizer. This argument for the presence of a surplus is untenable, as is well known by fisheries scientists. Many arguments more valid may be cited leading to an opposite conclusion.

In the first place such animals as the whale, the albacore or tuna perhaps consume more enemies of the sardine than they do of the sardine itself. These fish, such as the anchovies, the mackerels, red cod, etc., probably feed on the young, as well as on the adult sardine. The anchovy, for instance, has a beautiful straining apparatus in its gills with which it might remove the eggs and larvæ from the water to swallow them. And the sardine eggs and young float freely in the open sea for such fish to take. These small things are so delicate that they must be destroyed immediately and no method of ascertaining the amount consumed is at hand. It is, on the other hand, easy to satisfy one's self about the sardines such fish as mackerel consume. So the existence of the whale and albacore may be actually a benefit to the sardine fishery, and their destruction a disaster to the industry.

A classic case could be found in Alaska, where the numbers of herring should supposedly be increased by the practical extinction of the halibut, which consumes the herring in quantities. But careful investigation of the halibut food showed conclusively that it ate more enemies of the herring than it did of the herring. It ate gray cod,

long-jaw flounders, dog-fish, rat fish, red cod and black cod, each as often as it did herring—and every one of those species is a bitter enemy of the herring.

Similar cases of mistaken conclusions as to the harmfulness of birds may be found. For many birds eat injurious insects to an extent that far overbalances any harm the birds themselves do to crops. The same is perhaps true of the whale and the albacore.

In so far as the albacore is concerned, an endeavor on the part of the writer to investigate its food met with disaster. For it was soon found that the fishermen were using sardines, anchovies and other fish for bait, or to chum the fish, and that the albacore which were caught had naturally a great many such bait fish in their stomachs. The same applies to the salmon. But, indeed, even ignoring this fact, it was found that such things as squids, small crustacea, and fish of other species formed a large part, at times all of the food of the albacore, tunas and salmons.

Another argument just as valid as that in support of the theory of the surplus of sardines is available. For it is common knowledge that the whale eats even more anchovies than it does sardines, and the anchovies may make serious inroads on the food supply of the sardine, being nearly the same type of feeder. Therefore the destruction of the anchovies must be advantageous, and the whale a benefactor, indeed.

The point to what has been said, we would emphasize, is the positive fact that nature is exceedingly complex, and that those who come to ready and easy conclusions are inevitably wrong. We do not wish to assert in an unqualified way that we are correct in saying that the destruction of any such animals as the whale, the albacore, the tuna and such animals is a disaster to the sardine, but we do wish to assert that the balance is just as likely to go that way as the other, and probably does. And that would be the case were all the suppositions advanced above untrue.

And as a matter of fact, if such great numbers of albacore, of of tuna and of whales have been taken, it may be high time to propose some protection for them.

The argument that there is now a surplus of sardines is a strange one to meet at this time. If we had three vessels at sea in a storm and two of them were sunk, would we talk confidently about the safety of the other? Yet that is just what is happening. The great salmon fisheries of the Alaskan and British Columbian coasts are on the verge of extinction, as everyone now knows, despite the fact that years ago statements that the supply was inexhaustible were quoted just as freely as they are now about the sardine. And the same is true of the halibut fisheries to a still greater extent. As in those two fisheries, once the two greatest on our coast, disaster has come, so may we well watch vigilantly lest disaster come to another great fishery, that for the sardine. Abstract speculation on intricate things such as the effect of killing off the enemies of the sardine is worse than useless in the face of real experience.

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All material for publication should be sent to **H. C. Bryant, Museum of Vertebrate Zoology, Berkeley, Cal.**

MAY 6, 1921.

PEOPLE AND THE LAW.

People obey the laws because they believe them wise and just—not merely because the laws happen to be.

That fish, or that game law serves best its purpose which is based on real conditions, exact needs and which operates without undue injury to any person or class.—Adapted from *Pascal.*

THE 1918–1920 BIENNIAL REPORT.

The usual biennial review of the work of the Fish and Game Commission has appeared in a striking green cover with a colored reproduction of the Loch Leven trout. The report, which contains 150 pages, deals with the work of the various departments and is abundantly illustrated with photographs showing the work and accomplishments of the Commission. A comparison of this volume with the first report issued in 1870 furnishes an interesting contrast and proves that during fifty years of service to the state there has been great improvement in organization and in results.

In the introductory pages a tribute is paid to the men who so creditably served their country during the world war and a page is devoted to six employees who have died during the past two years.

Outstanding features of the biennial period have been the rearing and planting of 34,000,000 trout fry, the greatest number ever planted by the Commission in its history in a like period. In addition approximately 29,000,000 Chinook salmon were distributed in the Sacramento, Klamath and Eel rivers. The new Tahoe Hatchery with four times the capacity of the old one is described and figured.

The number of arrests and amount of fines assessed on offenders during the biennial period is the greatest in the history of the Commission—1,891 arrests and $49,426 in fines.

The Commercial Fisheries Department reports wonderful progress in connection with the gathering of fisheries statistics and the solving of many problems relating to the fisheries. Several graphs vividly show the growth of the different fishing industries and the output of the canneries.

Among the legislative recommendations in the report are a shortened trout season and a one buck limit on deer.

The educational and publicity campaign beginning in 1914 has been successfully continued. Particularly noticeable results have been obtained in the schools and in the summer resorts of the state.

NEW FISH BULLETINS.

There are now ready for distribution two new fish bulletins. Bulletin No. 4 is entitled, "The edible clams, mussels and scallops of California," and is the result of research made by Professor F. W. Weymouth, of Stanford University. The bulletin contains seventy-five pages, nineteen plates and twenty-six figures. The author notes that there were two purposes in issuing it. "First, it is an attempt to estimate the economic importance to the state of the bivalves here treated by putting on record the extent and position of the available mollusk producing grounds, the number and abundance of the edible species, and, by contributing to a knowledge of their life histories, lay the foundation for such protective legislation as may in the future be found necessary. Secondly, it proposes to make available to the camper and amateur naturalist a means of identifying the more common and important bivalves." Perhaps the most attractive feature of the bulletin is a key well illustrated which should be usable by the amateur in identifying any of the species of mollusks found in the state.

Fish Bulletin No. 5 is entitled, "A key to the families of marine fishes of the West Coast," and appears under the authorship of Professor E. C. Starks, of Stanford University. The key has been tested out by the students of Stanford University and should be of value to any one in the identification of fish which fall into their hands.

FISHCULTURAL METHODS UPHELD.

A recent newspaper attack on the methods and accomplishments of the fish-cultural department has brought forth many protests. Resolutions and letters in large quantity have been received from sportsmen's clubs, chambers of commerce, forest supervisors, boards of supervisors, and private individuals pointing out the successes attained in planting trout. Among the sportsmen's clubs defending the present methods are the Sierra Rod and Gun Club, the Grass Valley Sportsmen's Club, Lindsay Fish and Game Protective Association, El Dorado County Rod and Gun Club, Caspar Rod and Gun Club, Fresno Sportsmen's Club, Yuba County Fish and Game Association, and the Alturas Sportsmen's Club.

All unite in pointing out that in order to keep up the supply of trout where there is heavy fishing, it is essential to stock the streams annually. Many point out that had not annual plants been made the streams would now be barren of fish life. Fortunately, the opposite condition exists, owing to fishcultural operations.

Mr. C. J. Walters, of Independence, states that streams that are extensively fished have increased wonderfully since the planting of fry began. According to Robert E. Eddy, Secretary of the Lindsay Fish and Game Protective Association, it is the unanimous testimony of our members who know the streams and of ranchers in the mountains, "that fish are now being taken from places formerly barren, since planting began regularly in this section." George A. Green, President of the El Dorado Rod and Gun Club, writes: "Prior to 1910 no eastern brook trout had ever been taken from the American River, the fish life being entirely limited to the rainbow trout. In 1910, our club received from the Fish and Game Commission some eastern brook trout fry. These were planted in the American River near Kyburz. We have received and planted some eastern brook fry every season since. Today fifty per cent of the trout taken from the American River between Riverton and Phillips Station are eastern brook trout. The same holds good in regard to all other streams in our country."

All of the communications report satisfactory results and state that the fry are received in uniformly good condition. The one complaint evidenced is that individuals and organizations are unable to secure as many fish as they desire for planting purposes.

IN MEMORIAM—FRANK SHOOK.

It is to be regretted that deputy Frank Shook, one of the oldest and most loyal deputies in the employ of the Commission, died on January 16, 1921, at his home in Salinas.

From the time of his appointment as deputy, on November 15, 1907, Frank Shook was one of the most sincere workers of this Commission. He was always on duty and always gave the best service possible. He not only knew the violator and his ways, but he knew thoroughly Monterey County, the country which he patrolled, and it is because of the fact that he possessed all of the many qualities that are so necessary in one entrusted with the enforcement of the law that he was so valued and trusted as an employee of the Commission. That his loyal service was appreciated by the Fish and Game Commission goes without saying.—J. S. H.

THE NATIONAL GAME CONFERENCE.

The annual National Game Conference under the auspices of the American Game Protective Association was held in New York City on January 24 and 25. For the first time, the California Fish and Game Commission was represented at this conference. Dr. H. C. Bryant was able to attend, owing to a lecture program regarding nature guide work which was made possible by Mr. Stephen T. Mather, Director of the National Parks. Dr. Bryant gave an illustrated lecture on the subject, "Education as part of the conservation program," in which the work of the California Fish and Game Commission was outlined; emphasis being placed on the work in the schools and in the summer resorts. At the banquet, the last night of the conference, motion pictures showing wildfowl on Lake Merritt, California's first game refuge, were shown and received very favorable comment.

Outstanding features of the program were the discussions on a federal license,

to take the form of a stamp which can be pasted on the state license, and on the need for a treaty with neighboring countries relative to migratory fishes to supplement the one relative to birds, which is already in existence.

Considerable interest was also displayed in the report of the Virginia Fish and Game Commissioner regarding a law to control the vagrant dog. The law which is administered by the Fish and Game Commission has been effective in the destruction of 30,000 vagrant dogs since its enactment. That any state should have a dog problem, as well as a cat problem, was a surprise to those attending the conference.

A large number of resolutions relative to the conservation of game were passed.

THE STEELHEAD, A DISTINCT SPECIES.

The exact status of the steelhead trout has long been a mooted question. Although for many years considered specifically distinct, it has in more recent years been considered a sea run form of the rainbow. The United States Bureau of Fisheries now announces (Bureau of Fisheries Document No. 896, pp. 6-7) that Dr. W. C. Kendall, scientific assistant and ichthyologist, is bringing to completion a report which it is believed will settle the much discussed question of the specific identity or distinctness of the rainbow and steelhead trouts.

"After a careful study of the fish from taxonomical, anatomical, and distributional evidence the conclusion is reached that there are at least two wild forms which have been confused under the names of rainbow and steelhead trouts. One is predominantly migratory (ascending fresh waters from the sea), the other predominantly a permanent fresh water inhabitant. The name *Salmo iridcus* was originally bestowed upon a small steelhead form, as was also *Salmo rivularis*. There is absolutely no doubt concerning the proper application of *Salmo gairdnerii* to the steelhead, as Richardson's description is that of a large Columbia River fish and not a small blueback salmon (*Oncorhynchus nerka*), as one writer has stated. Contrary to current descriptions, the steelhead has larger (fewer) scales than the rainbow, and there appear to be other though inconspicuous and concealed structural differences.

There is probably more than one species or race of rainbow trout, and possibly also of steelhead. However, the rainbow trout of fish culture is largely from McCloud River (California) stock and should bear the name, not *Salmo irideus*, but *Salmo shasta*. The fishcultural rainbow stock has been more or less affected by admixture of another form principally from Klamath River, which may be another form or species of rainbow or perhaps a steelhead. This admixture is clearly perceived in the appearance and structure of many specimens of the rainbow stock of some of the hatcheries. The steelhead stock has always, so far as known, been unadulterated *Salmo gairdnerii*, although in the distribution from hatcheries it is known that in some instances the two forms have been regarded as identical and distributed as rainbow trout. Pure *Salmo shasta* is distinguished from pure *Salmo gairdnerii* by the smaller scales of the former."

SALMON DESTROYED ON SPAWNING BEDS.

Because of the law which allows of the taking of three salmon by means of a spear, in districts one and two, between September 25 and November 15, many salmon are being destroyed on the spawning beds in Shasta and Siskiyou counties. Aliens, as in other cases, are the greatest violators. They often build a sort of trap across a stream and working at night spear the fish as they move through a narrow entrance to the trap. As many of the fish are unfit for food, because on the spawning grounds, these violators sometimes kill as many as from fifteen to twenty fish and save but the three that they are allowed by law. The deputies of the Commission have difficulty in apprehending these violators because they work at night and because they are not to be found with more than the legal limit in their possession. Fortunately, sentiment in these counties is changing and many now see the danger in allowing salmon to be taken by means of a spear during the spawning season. It is to be hoped that there will be sufficient sentiment to make possible a change in the law during the present session of the legislature.

BLUE JAY HUNT IN SAN BENITO COUNTY.

Several years ago blue jay hunts were in vogue, but more recently little attention has been paid to the bird accused by the sportsmen of destroying quail's eggs. Of late, however, a well organized blue jay hunt was held at Hollister, California. Sixty sportsmen were divided into two rival teams and a week chosen for the hunt. When the final count of birds was made at the end of the week the total showed 1531 blue jays. One team outdistanced the other by 210 birds and this winning team were the guests at a big barbecue held by the other team. One hunter bagged 233, and the second best was 139.

FIG. 38. The result of a blue jay hunt at Hollister, California. An organized blue jay hunt by sportsmen of the region netted 1531 blue jays in one week.

Whether such organized blue jay hunts are beneficial to the interests of game and other birds is still doubtful. That the blue jay deserves to be placed on the black list few will deny, but that blue jays good and bad, and there are good blue jays, should be killed off in large numbers is a question. Whether blue jays are actually as destructive to quail as to tree nesting birds is also something that still has to be proved. Doubtless, many arguments can be given on both sides, and the thing which is needed is more evidence. When those engaged in such a hunt spend as much energy in trying to determine the food of the blue jay as they do in making a large kill of birds a solution of the problem will be forthcoming.

MORE FINES FOR HUNTING OUT OF SEASON.

Apprehended for shooting four pintail ducks out of season, a Missouri hunter on March 7, 1921, was fined $200 and costs by Federal Judge Van Valkenburg, sitting at St. Joseph, Missouri. This sentence follows closely upon the conviction of a hunter in New Jersey before a federal judge by whom he was fined $200 and costs and sentenced to jail for ten days.

The spring flight of migratory birds is at its height during April, and the Biological Survey of the United States Department of Agriculture is putting forth every effort to see that they are permitted to go north to their nesting grounds unmolested. Due to the active cooperation of federal game wardens and state authorities, fewer violations of the federal law are occurring this spring than formerly. Nevertheless, some unscrupulous hunters are taking a chance; arrests for shooting out of season are being made by the game wardens and convictions are being obtained in nearly all cases.

MORE AND BETTER FUR.

"The demand for fur is far greater than can be met. Evidently the time is at hand when steps should be taken to increase and improve the fur supply. Trappers, dealers, manufacturers, and wearers, possessing in the aggregate a tremendous moral and financial influence, want more and better fur.

"Among the bad practices which have reduced the number of fur bearers are: (1) Using poison, which kills many animals that are not found before their skins are spoiled; (2) smoking animals out of their dens, which often suffocates them instead of forcing them out; (3) destroying dens, which either leaves the animals without suitable places in which to rear their young or drives them out of the neighborhood altogether; (4) trapping early in fall, which catches animals having small, unprime pelts before they are old enough to be suspicious of traps; and (5) trapping late in spring, which destroys breeding females with young.

"If no early or late trapping were done there would be fewer animals taken, but on the other hand the value of the catch and the number of animals left to breed another season would be far greater. Skins are prime for about two months after the molt is completed, and during this time they have no dark spots on the flesh side. They are worth much more when prime (. . . .) than when unprime (. . . .). Muskrat and beaver pelts are best in February and March, while those of other fur bearers are best from late in November till about the end of January."—Yrbk. U. S. Dept. Agri. 1919, Separate 823.

RAINBOW TROUT IN HAWAII.

In the Fisheries Service Bulletin, No. 69, issued February 1, 1921, Mr. H. L. Kelly, a former assistant of the Bureau of Fisheries and now the executive officer of the Fish and Game Commission of the Territory of Hawaii, gives an interesting report on the rainbow trout resulting from eggs supplied by the Bureau of Fisheries in 1919. Before making an application for another shipment of eggs to be hatched and planted on government reserves, Mr. Kelly went to Kauai to determine how the trout planted in the streams of the island were thriving. He found the people enthusiastic over the species and in the streams which had been stocked many trout were seen. Some of the fish were caught. The largest measured $7\frac{3}{8}$ inches and others $5\frac{7}{8}$ inches. These were taken exactly six months after planting. Requests were made for plantings in the mountain streams of the islands of Molokai and Maui. Their beautiful coloration and rapid rate of growth are prime factors in the success of the importation experiment to the sportsman and the fishculturist alike of Hawaii.

A DECLINE IN THE CONSUMPTION OF FISH.

"How are we to meet the decline in the consumption of fish and the resultant hardship on the fishing industry of the United States?"—is the question of the United States Bureau of Fisheries. During the period of the war the consumption of fishery products grew to considerable extent, which resulted in an expansion of facilities for the capture, preservation and marketing of these products. Despite the more adequate facilities for supply and the general advancing costs of materials and labor, there was a decline in the fishing industry.

Not only on the eastern coast is this the case but it would appear to be true to a certain extent in the west as well, as is demonstrated by a graph published in the 1920 Biennial Report of the California Fish and Game Commission giving a comparison of fish of all kinds packed in northern and southern California. A slight decline in the total number of cases of fish packed is shown by the following figures:

	1918	1919
Southern	1,385,202	1,166,435
Northern	729,100	905,206
Total	2,114,302	2,071,641

1918	2,114,302
1919	2,071,641
	42,661

However, in California, the salmon, and particularly the sardine catch, has steadily increased, as stated for the period 1917-1919, yet the estimated 1920 pack of canned salmon in the United States,

including Alaska, is about 3½ million cases less than in 1917 and includes about 2½ million cases of the cheaper grades (pink and chum), which it is reported are being offered for sale for less than the cost of production and can be sold with profit by the retailer at a low price. The canners of sardines and the cheaper grades of tuna are confronted with similar difficulties.

The problem is indeed one of importance, for aside from the fact that fish is our cheapest and best source of natural food supply the fishermen are, most of them, small, individual producers with little or no training for a change of livelihood and these men will suffer, if the industry is allowed thus to decline.

accidents during the open season, as well as being a conservation measure. In 1917, twenty-eight fatal hunting accidents occurred in Michigan and Wisconsin. Out of this total, twenty-two occurred in Michigan as against only six in Wisconsin. The reason for the disparity was again laid to the fact that bucks only were allowed to be killed by deer hunters in Wisconsin, while in Michigan the big game hunters were allowed to kill without waiting to see the horns.

And so it continues to be demonstrated that the buck law in California and other states is largely responsible for the reduction in the number of hunting accidents.

FIG. 39. Fishing on the north fork of the Feather River. The trout season opened April 1, as usual. Photograph by F. A. Farnum.

BUCK LAW DECREASES HUNTING ACCIDENTS IN NEW YORK.

Quoting from the Conservationist for December, 1920: "The deer hunting season of 1920 closed with only one fatality due to a man being shot in mistake for a deer. Last year there were nine deaths from this cause, during a season when both bucks and does could be legally shot. Restoration of the buck law, and the requirement that a hunter look for horns before he shoots, is unquestionably to be thanked for the low mortality this year."

The buck law is one of the prime factors in reducing the number of hunting

A CONSERVATION READER FOR CALIFORNIA PUBLIC SCHOOLS.

"The wave of enthusiasm for the conservation of our natural resources must reach the children or it will expend much of its force uselessly." With this end in view, H. W. Fairbanks of Berkeley, California, who is the author of many text books on geography, has written a Conservation Reader.* The book brings out in a simple and interesting manner the principles of conservation. After introductory chapters giving a contrast be-

*Fairbanks, H. W., 1920. Conservation Reader (World Book Co., N. Y.) VI, 216 pages, illustrated.

tween the past and the present, the conservation of soils, water, trees, forests, wild flowers, coal, oil, gas, aquatic animals, and birds, is outlined. The book is illustrated with two colored plates furnished by the National Association of Audubon Societies and with various reproductions of photographs.

"The movement for the preservation of natural resources can succeed only with the establishment of an enlightened public sentiment on the subject. To create and maintain such a sentiment is the proper work of the schools." The use of this conservation reader in the schools should help greatly in developing the right attitude toward natural resources and the consequent attainment of proper conservation of them.

PRESIDENT HARDING IN SYMPATHY WITH WILD LIFE CONSERVATION.

Mr. T. G. Pearson, President of the National Association of Audubon Societies, in answer to a telegram, received the following telegram from President Harding, who was at the time President-elect.

"I am fully in favor of a policy which will guard the integrity of our national parks and our bird reservations. I favor the enforcement of our treaty with Canada for the protection of valuable migratory birds. Please accept my greetings to your Association." (Signed)

WARREN G. HARDING.

Those who are interested in our national parks and in the conservation of our wild life take great satisfaction in the expressed attitude of President Harding.

FUR-BEARERS PROTECTED IN TRINITY REFUGE.

Game Refuge No. 1-D has been closed to trapping except for coyotes, mountain lions and bobcats. This restriction will bring about the same object with reference to fur-bearers as that attained for deer. The refuge is an ideal one for this purpose and if the law can be enforced and the predatory animals exterminated, it is absolutely certain that these species will be preserved forever, and that to a large degree the overflow can be legitimately trapped. Similar provisions for preserving fur-bearers should be applied to other refuges.—E. V. Jotter, Weaverville, California.

THE FUR SUPPLY AND ITS MAINTENANCE.

Mr. Ned Dearborn, Assistant Biologist, Bureau of Biological Survey, has recently written a pamphlet entitled "Maintenance of the Fur Supply."* In introducing the subject of his paper he says, "to direct attention to the great commercial importance of fur; to emphasize the need of maintaining the supply, which lately has been declining at an alarming rate; and to point out ways by which this supply may not only be maintained as to quantity but improved as to quality, is the purpose of this circular.

"The subject is discussed from the viewpoint of the farmer, to whom fur-bearing animals, if rightly managed, will be a source of interest and profit."

"The commercial history of America begins with fur, and from the early days down to the present this has been an important article in our domestic and foreign trade."

The World War has changed the center of the world fur trade from Europe to the United States, and the center of manufacture in the United States is New York City or the near vicinity. The United States has learned the art of dressing and dyeing the skins, as is demonstrated by the drop of forty per cent in the ratio of dressed and raw skins imported into the country. In 1914, dressed skins imported were worth $3,500,000, while raw skins imported were worth $7,500,000. In 1919, $4,000,000 worth of dressed skins were imported, as against $69,000,000 worth of raw skins.

"A concrete example of the rise in fur prices is afforded by the actual record of one man's fur-lined overcoat. This coat, lined with mink, in 1913 cost $500. After wearing the coat two years the owner sold the mink lining for $1,000 and replaced it with nutria at a cost of $150. Two years later, in 1917, he had the nutria lining removed and sold it for $250. A muskrat lining was then put in the coat at a cost of $55, which, in 1919, was in turn removed and sold for $300. The original purchaser still has the shell."

Although the price of furs is bound to drop to a certain extent, the fur dealers are not uneasy. The use of fur is being

*U. S. Dept. Agric., Dept. Circ. 135, Nov., 1920.

widely exploited—is being advertised for summer use as well as for winter—yet, there are two important factors to be reckoned with: (1) About one-half of the skins disposed of at American auction sales are of foreign origin. (2) The supply of furs is waning to the extent that if the present condition should continue for a few years the supply in settled districts would come to an end.

The following remedies for the situation are pointed out by Mr. Dearborn:

(1) All trappers should be licensed at a nominal fee and at the end of the trapping season should turn in a complete report of the skins taken. This report to be published for the benefit of the public.

(2) Farmers should be made to appreciate the possibilities of this source of income. They should know that although most of the important small fur-bearers are carniverous, few of them are destroyers of poultry. "Among fur animals, as among men, the proportion of criminals is small." Skunk-proof poultry yards should be installed, and the subsequent value of enticing the skunk to the farmer's land to destroy the rodents advocated.

Further emphasis should be placed on this natural source of income to the farmer, from animals which he neither has to feed nor shelter, so long as he recognizes the value of preserving their dens and killing them with discretion.

(3) The wisdom of killing fur-bearers only when the peltries are prime is forcefully brought out to the farmer by the associative argument, namely, that it is just as short-sighted for the farmer or trapper to kill fur-bearers before the peltries are prime as it is to harvest crops before they are ripe or when they are overripe. Hence, the value of limiting the trapping to a two months open season which is believed to be the most effective and efficient means of obtaining results.

(4) The importance of having fur animal preserves and of domesticating the animals is of moment. Now that the characters of North American animals and their geographical distribution are well known, the production of superior fur should be much more possible.

(5) Animal dens should be protected, and the knowledge of the local attachment of animals used to good advantage. The use of poison, smoke, gas, or fumes in taking fur-bearing animals should be prohibited.

Mr. Dearborn's paper is of importance to Californians for he points out that in this state the asset value of wild fur-bearers to the people of the state has been estimated at $7,125,000. The annual catch of fur in the state brings about four per cent of this huge sum. "By proper conservation it might readily be doubled." Therefore, the value of encouraging and promoting the fur industry along the right channels at this embryonic period in its development would seem most advantageous.

CAMP SANITATION.

Are you going camping this summer? The mountains of California constitute one of the most delightful of recreation areas, and an outing there may be most healthful and enjoyable if proper use is made of the opportunities offered. Proper use means, in a very important degree, good sanitation. If you take an outing you will find that your pleasure is marred when you discover evidences of careless habits of other campers. Remember that you are one of many thousands of campers that go to the mountains during a season, and that all have a right to expect you to avoid defiling the pleasure ground that is theirs as well as yours. Remember ,too, that these mountains are the catchment areas for drinking water supplies of many thousands of people and that the purity of these supplies depends very largely upon the efforts of yourself and other campers to practice intelligent sanitation.

The principles of good mountain sanitation are simple and their practice is not more burdensome than maintaining customary cleanliness around home. At home the person of common decency does not tolerate an accumulation in his yard of cans, bottles, papers, garbage and fecal matter, yet why is it that one may frequently see an otherwise attractive spot in the mountains littered with these things? Is it because the camp ground

is only a temporary stopping place and campers lack the neighborliness to clean up their own refuse out of kindness for those who follow? Is it that same return-to-nature, otherwise carelessness, that on a camping expedition contents a man to go a week or two without a shave? It is thoughtlessness, and carelessness, perhaps laziness, but no part of nature.

The principles of good mountain sanitation are simple. Burn or bury all refuse and use care not to contaminate streams. There you have a complete program for keeping our recreation areas clean. Take a small shovel and some matches with you on your camping trip and use them with prudence. They will be useful for other than sanitary purposes.

When you build your camp fire burn your waste paper and when the meal is finished burn your garbage. Bury these materials if you do not have a camp fire; don't leave them for the next fellow to dispose of. Bury also your unburnable refuse, such as cans and bottles, or throw them into the underbrush well out of sight. Practice the ordinary principles of good housekeeping.

"Leave your camp as you would like to find it. Keep the pleasure grounds of America clean."—California State Board of Health.

NEW YORK'S ANNUAL GAME DIVIDEND.

Beginning in 1919 all owners of hunting licenses in the State of New York were required to report the game killed for the preceding year. The statistics compiled show that there were reported 465,590 cottontail rabbits; ducks taking a fifth place in the kill showing a total of 109,663; male deer totaled 8,293. The grand total of game taken in 1918 was 1,526,960.

The game and fur-bearing animals of New York State, if capitalized, are worth not less than $53,000,000; they return an annual dividend of more than $3,200,000; and they cost the state for their protection and increase the nominal sum of $182,000. This cost of protection and increase is thus less than six per cent of the annual dividend.

FACTS OF CURRENT INTEREST.

In 1920, Trinity County spent $1,323 in controlling the coyote. A bounty of $3 each was paid on 441 coyotes on which the reward was claimed.

Salmon have appeared early this season, 150 pounds having been taken by trawling near the Farallones on March 3, 1921. In 1919 and 1920 the first salmon were caught after the middle of March.

Although some of the ayu eggs imported from Japan hatched, they were so weakened by fungus that none of them survived.

Deputies Carpenter and Britton arrested two men at Arbuckle during March who had in their machine 184 ducks. They were presumably on their way to San Francisco to dispose of this illegal game. Both men were taken before Justice Jones at Williams, who sentenced them to sixty and ninety days, respectively, in the county jail.

A bill before the legislature provides for a limit of ten abalones per day. This would effectively prohibit the commercialization of this sea food.

Large shipments of edible crabs have been arriving in San Francisco. On March 12, 1921, a shipment amounting to four truckloads was received.

No less than three bills which would abolish the present Fish and Game Commission have been introduced in the legislature. Two of them would make fish and game work depend upon appropriations by the legislature.

HATCHERY NOTES.

W. H. SHEBLEY, Editor.

SEASON PROSPECTS.

As outlined in the January number of CALIFORNIA FISH AND GAME, the past season was a very successful one from the standpoint of the number of trout fry reared, the quality of the fish planted and the systematic manner in which they were distributed, when the difficulties encountered in the prosecution of the work, due to the extreme drought, are taken into consideration.

Plans are under way for still further improvements in the fish distribution work during the coming season. Within the next two weeks all applicants, who received trout fry last season, will be sent application blanks and will be requested to file their applications prior to the thirtieth day of April. Judging from recent correspondence with many of last season's applicants, there is going to be an unprecedented demand for trout fry this coming season. This is due to several reasons. There were very few losses of fish last season. The success of fish planting during the past few seasons due to our closer cooperation with the applicants and to sending of special messengers, trained in fish planting work, to assist and instruct in the best methods of handling and planting the fry is beginning to show more satisfactory results and the public is coming more generally to realize that it is only by extensive restocking of their fishing streams and lakes each year, that they may prevent depletion due to excessive fishing.

Public association of anglers, resort owners and individuals, who are interested in one way or another in fishing, are taking more interest in the work, as the efficiency of our methods is demonstrated to them. Then to, Boards of Supervisors, Chambers of Commerce and public officials, having the business interests of their communities at heart, are coming to realize that fish and game are among the best assets to a community, and that it is only by keeping the streams stocked with trout fry from the state hatcheries that the depletion of the fish in the streams and lakes can be avoided. They therefore consider, from a business standpoint, that appropriations of adequate amounts from their funds to provide for proper distribution of the fish allotted to them by the Commission is money well spent.

During the past several years of drought, it has been extremely difficult for us to obtain a sufficient number of trout eggs to supply all of the fry required to adequately stock the waters of the state, despite the rapid increase in the extent of our operations. This season we hope to materially increase our output of trout fry. No effort has been spared to make the coming season the most productive of results that we have ever had. The older egg-collecting stations have been enlarged and improved to handle a greater output and hatcheries have been equipped to take care of all of the eggs which it is possible to secure.

The new Lake Tahoe Hatchery, as previously mentioned, has been finished and is ready for occupancy. The Mount Tallac Hatchery will be opened as usual about the middle of March and in addition to the egg-collecting operations, which have been carried on in past years at the mouth of Taylor Creek, a new egg-collecting station will be operated on the upper Truckee River.

Arrangements are being made to establish an experimental hatchery near Blairsden, in Plumas County, to take care of the requirements of the Feather River district, as well as the North Yuba River district near Sierra City. If this station can be successfully established, it will eliminate to a very great extent, the necessity of transporting trout fry for stocking the streams in Plumas County from the Mount Shasta Hatchery. This long haul is very hard on the fish and is very expensive. If rainbow trout can be successfully reared at the Feather River, near Blairsden, which is centrally located, they can be distributed to far better advantage and with much less expense than to ship them from so great a distance as Sisson.

By the establishment of this hatchery that section of the Yuba River in the vicinity of Sierra City can be handled to better advantage, as the long haul from Sisson to Nevada City and thence by auto

truck over the heavy grades along the Yuba River will be eliminated.

Operations at the Mount Shasta Hatchery and the various egg-collecting stations along the Klamath River are in full swing. While it is too early in the season to state definitely the number of eggs, which we can expect from the Klamath River stations, we have every reason to believe that the take will be very satisfactory. The first of the rainbow trout are "running" in Bogus Creek, Camp Creek and Fall Creek and something over a million of eggs have been taken to date. The run of fish in Cottonwood Creek is somewhat later, but indications are for a successful take of eggs at the Hornbrook Station. The salmon fry which are being hatched at Mount Shasta and Fall Creek hatcheries are doing nicely and will furnish a fine lot of fry for distribution this spring and for placing in the large salmon rearing lakes where they are held throughout the summer months and then liberated in the upper reaches of the Sacramento and Klamath rivers next fall.

Steelhead egg-collecting operations are under way at the Scott Creek and Snow Mountain collecting stations and indications are that a successful take of eggs at both places will be secured.

Ukiah Hatchery is in readiness for the reception of the steelhead eggs from the Snow Mountain Station.

Brookdale Hatchery is also open and prepared for operations. Extensive re-

FIG. 40. Copco Dam on the Klamath River. This dam is so high that a fish ladder was not feasible. Consequently, the California-Oregon Power Company was compelled to build a fish hatchery in lieu of a fishway. Photograph by C. Westerfeld.

pairs to the water supply system have been made and the station generally is in first class condition. Over three-quarters of a million of steelhead eggs have been taken at the Scott Creek Station to date and are being cared for at Brookdale. A half million salmon fry are being reared at the Fort Seward Hatchery for distribution this spring in Eel River, Mad River and tributaries of Humboldt Bay. The hatchery is all ready for the reception of steelhead trout eggs from Ukiah Hatchery.

Domingo Springs, Almanor and Clear Creek hatcheries will be open for operations during the middle and latter part of March.

A crew of fishculturists will be sent into the Big Bear Lake district within the next two weeks and operations will be commenced as soon as the fish start "running" at the North Creek Station.

The Kaweah Hatchery will open for operations shortly after the first of April.

Wawona Hatchery will, as usual, be opened sometime during April.

The San Joaquin River Experimental Station is still in operation. The weather has been extremely cold, the water being close to the freezing point for days at a time and development of the salmon eggs has been very greatly retarded.

Three hundred thousand Loch Leven trout eggs were shipped during the latter part of December to the Mount Whitney Hatchery and the resulting fry are doing nicely. Everything at this station is in readiness for the commencement of the season's operations. The seasonal work on the grounds has been progressing nicely and the gardens promise to be in even better shape than they were last season.

COMMERCIAL FISHERY NOTES.

N. B. Scofield, Editor.

SHALL WE USE FOOD FISH FOR FERTILIZER?

With a poor market for canned fishery products and a strong market for fertilizer and poultry foods, a difficult problem confronts the Fish and Game Commission and the state legislature. Canneries at Monterey and in southern California are asking for permits to catch sardines in quantity for use at reduction plants rather than for use in the canneries. So great is the demand made by the canneries that a bill has been introduced into the legislature which would allow the use of food fishes for fertilizer and poultry products. Up to this time, only ten to twenty per cent of the catch, which was considered as "overcatch," has been utilized in the reduction plants. It is feared that the sardine has already suffered from over fishing, owing to the great demand of the past few years, and that a further toll levied would deplete the supply. Present plans to continue fishing obviates the chance of the species to recuperate and assure an abundance of fish in the future.

In order to test the present law which allows only the spoiled fish and the overcatch to be utilized in the reduction plants, cannery men of southern California have instituted a test case which is now before the courts.

FISHERIES, 1920.

During the year 1920 there were 208,342,816 pounds of fresh fish and 6,423,911 pounds of mollusks and crustaceans, making a grand total of 214,766,727 pounds of fishery products, taken in the waters of this state. The catch for 1920 shows considerable decrease in the totals in comparison with the catch for 1919 which was 262,258,511 pounds. The sardine catch showed the greatest decrease, which was approximately 35,000,000 pounds less than during 1919. Salmon, yellowtail, sole, squid and clams also declined, while the catch of albacore showed an increase of about 5,000,000 pounds.

The decreased catch of sardines was on account of the poor demand for the canned and salted products and canneries did not operate their plants to full capacity during the year and many of those plants operating closed down early in the fall. During the spring of 1919 there were great quantities of sardines used in reduction plants for fish meal. In the summer of 1919, a law went into effect preventing the use of edible fish in reduction plants and during 1920 there was no straight fishing for sardines for reduction purposes.

The salmon catch in the state shows a decrease of approximately two million pounds, the total catch for the year being 11,138,693 pounds. Along the coast north of San Francisco the catch was about the same as the previous year, some particular localities showing slight increase, while other districts show a small decrease. The decrease in the catch was on Monterey Bay and the Sacramento River. The Monterey Bay catch was 1,300,000 pounds less than in 1919, which was by no means a good year for that district. The Sacramento River catch declined about 700,000 pounds. The water was very low in the Sacramento River during August and September and no doubt this fact, together with the poor quality of salmon and low price, had considerable effect on the catch as a number of the fishermen laid up their boats and stopped fishing some time before the season closed on September 24.

During 1920 there were 1,941,984 cases of fish canned. Of this amount, 1,062,996 cases were sardines and 835,645 cases were tuna, these two varieties of fish being the principal fish used for canning purposes in this state. The tuna pack for 1920 was greater than during the previous year, while the sardine pack was lighter. The total pack of all varieties canned in 1920 was about 130,000 cases less than during 1919.

Complete statistics of the fisheries for the year 1920 will be published at a later date and should show some very interesting data.—S. H. D.

SACRAMENTO RIVER SALMON MARKING, 1920.

When salmon hatching on a large scale began on this coast it was the custom to liberate the fry in the streams as soon as the yolk sacks had been absorbed. Of late years the fry have been held for longer periods of time at the hatcheries on the belief that larger fish are better able to take care of themselves when liberated in the streams. The small fry in the hatchery troughs are of necessity crowded and are accustomed to being fed at regular intervals. It is thought that planting these small fry in a stream is too sudden a change and that too many fall a prey to enemies before they learn to avoid dangers and forage for themselves. To overcome this difficulty the small fry are transferred from the crowded hatchery trough to a large pond or lake where they have more room and are often able to find some natural food. From the pond the fry may be transferred to the stream when they are considered to be of sufficient size or when the height of water in the stream is considered most favorable.

Proof of the relative success of different times of liberating has been lacking, partially due to the difficulty of securing data. One method of securing this proof is to mark some of the young fish from two or more lots of fry liberated at different times. A comparison of the number from each lot recovered when they return to spawn would throw some light on the success of the different methods of liberating. The great difficulty in all such marking experiments is that so few marked fish are recovered. In the cleaning sheds large numbers of fish must be prepared for market in a short time and the fish are handled so rapidly that the missing fins of marked fish are either not noticed or are neglected, so that time is not taken to measure the fish, to take a sample of the scales and send the data to the office of the Fish and Game Commission. It is impractical to have a representative of the Commission at all of the fish sheds while fish are being received.

Another difficulty is the possible objection to marking fish by the removal of fins or with metal tags in that one is never sure that the behavior of such marked fish is typical of the behavior of unmarked fish of the same brood. Nevertheless some valuable data may be secured from such marking experiments. No other method has yet been devised for securing knowledge of the migrations of salmon in the ocean. In this connection, the first article in the January, 1921, number of this magazine is of special interest in showing that marked fish liberated in the Sacramento River were recovered not only in the Sacramento gill nets but also by trolling at such widely separated points as Monterey and Shelter Cove.

At a conference (September 8, 1920) between representatives of the California Fish and Game Commission it was de-

cided to try another King salmon marking experiment using Sacramento River eggs and liberating in the Sacramento. The object of the experiment was threefold, first, to contribute to the knowledge of ocean migrations and, second, to throw some light on scale readings by comparing the hatchery lake growth with the normal stream growth. The third and chief object was the comparison of three methods of liberating fry: liberating (1) large fry in the fall, (2) yearlings in the spring, and (3) small fry in the spring. To accomplish this it was planned to mark three batches of fish corresponding to the three enumerated above. Of the first two batches of fry from November, 1919, eggs, the first was to be marked and liberated in September, 1920, and the second in the spring of 1921. The third, from the fall of 1920 eggs, to be marked and liberated in the spring of 1921.

The first batch was marked as planned but the remainder of the experiment was unexpectedly upset by the behavior of the Sacramento River. These marked fish were to have been liberated sometime in November of 1920, but the fall floods of the Sacramento broke levees and it was feared that too great a loss of young fry would result if the liberation were made during the time of floods, so it was necessary to hold the fish over winter. However, the marking already completed should contribute something toward determining ocean migrations and possibly scale growth characteristics. The following is an account of the marking of the first batch of salmon fry.

Source of Eggs and Hatching.

The King or Chinook salmon eggs were taken by the United States Bureau of Fisheries at its substation on Mill Creek, a tributary of the Sacramento River, Tehama County, California. The eggs were taken the latter part of November, 1919, eyed at Mill Creek and sent in a shipment of 1,258,000 to Sisson, California, where they were received February 10, 1920. They were hatched the latter part of February at the Mount Shasta Hatchery, a state hatchery at Sisson. After several weeks in the troughs the fry were transferred on May 27, 1920, to Klink's Lake, one of the three lakes at the hatchery used for holding fry before the final planting in the stream. Here they remained till the end of September when part of them were returned to the hatchery for the purpose of marking.

Size of Fry.

These fry in the latter part of September, 1920, were ten months old reckoning from the time the eggs were collected or seven months from the time of hatching and had spent four months in Klink's Lake. A sample of 120 of these fish taken at random on September 27 showed an average length of 7.9 centimeters, or 3.1 inches. The greatest extremes in length of fish from this sample were 5.8 to 10.8 centimeters, or 2.3 to 4.25 inches. Other extreme cases were found where the range was from 4.5 to 13.0 centimeters, or 1.8 to 5.1 inches. The measurements were made from the tip of the nose to the tip of the central rays of the tail fin.

Mark and Number Marked.

The mark used was the removal of the adipose fin and the posterior half of the dorsal fin by clipping with cuticle nippers. Twenty thousand fry were marked, the marking being started on September 25 and finished on October 4, 1920. The marking was done by C. L. Frame of the Department of Fish Culture and W. L. Scofield of the Departmentof Commercial Fisheries.—W. L. Scofield.

A NEW SPECIES OF FISH FROM SANTA CATALINA ISLAND.

A specimen secured from the Avalon Aquarium has been described as a new species by Carl L. Hubbs, of the Museum of Zoology, of the University of Michigan.* This new fish is of particular interest because it has been named for Mr. William Francis Thompson, in charge of the State Fisheries Laboratory, of the California Fish and Game Commission, who is the author of many important works on marine fishes.

Sciaena thompsoni is most similar to three Panamaic species, but has fewer dorsal fin-rays and longer caudal peduncle, as well as other differences.

*Hubbs, Carl L. 1921. Description of a new Sciænoid fish from Santa Catalina Island, California. Occ. papers Museum of Zoology. No. 92, pp. 1–3, 1 pl.

BARBLESS FISH HOOKS.

Certain sportsmen's angling clubs are advocating the use of barbless hooks for catching fish, arguing that it is more sportsmanlike for it gives the fish a chance for its life. Besides its being a more creditable performance, they say, to catch fish with a barbless hook, the undersized fish when returned to the water will be more apt to survive as they are hurt very little.

It is interesting to note here that the commercial fishermen in fishing for long-finned tuna, skipjack and bonito in southern California use principally barbless hooks. The motive in their case is not to give the fish a better chance for their life, but to enable them to catch them faster, for the barbless hook is more quickly extracted and time is thus saved when the fish are coming fast.

FIG. 41. Barbless hooks used in the capture of tuna. Photograph by H. C. Bryant.

LIFE HISTORY NOTES.

THE PORCUPINE AS FOOD.

An animal, purely a vegetarian, that plays great havoc with gardens all through this country, is the porcupine. Sometimes, all of the garden stuff on outlying ranches in this section is completely destroyed by this pest. One of our rangers trapped a good many porcupines in his garden at a ranger station last summer, and he and his family used them to a considerable extent as food. I have eaten porcupine meat on several occasions during the past summer and found it to be quite palatable. Only for the fact that the meat is coarser in texture, one could imagine he was eating beef—provided of course, that the porcupine is young. An old porcupine is the toughest chewing imaginable—WM. S. BROWN, *Alturas, California.*

TREE SQUIRRELS INFESTED WITH SCABIES.

A dead California gray squirrel (*Sciurus griseus griseus*) was recently sent to the University of California by Deputy Euell Gray from Placerville, California, for post mortem, as it was afflicted with a disease which has been killing off great numbers of gray squirrels in the El Dorado National Forest. The disease was first noticed among the squirrels on the Georgetown Ridge in 1917. The gray squirrels were practically exterminated in this district. Since then, the disease has spread from this vicinity and is now most noticeable in the southeastern part of the county.

The first evidence of the disease is to be seen in a scaly or mangy appearance around the head and neck. This is followed by sores over the rest of the body and the hair falls off. Dead squirrels are to be found at the bases of trees and in streams of water.

Examination, by the veterinary and entomological departments of the University of California of the specimen sent in showed the disease to be a form of scabies. According to Professor Stanley B. Freeborn, the cause is to be found in a mite belonging to the genus *Notoedres*. These mites live in little tunnels dug in the skin and they eventually cause bad sores which weaken the animal to such an extent that death finally ensues. A closely related species found on the cat has recently been transmitted to the rabbit, horse, dog and man, always with difficulty and with no serious effect. Laboratory rabbits infested with a similar species of mite invariably die a more or less lingering death, if left untreated. Thorough washing followed by applications of sulphur ointment repeated three or four times, at intervals of five or six days, generally produces satisfactory cures in these animals, if taken early.

It is to be hoped that this epidemic will disappear, as do most epidemics of this kind.—H. C. Bryant, *Berkeley, Calif.*

ANTELOPE SHOW INCREASE.

Prong-horn antelope (*Antilocapra americana*) near Mount Dome in Butte Creek Valley appear to be on the increase. Mr. Crawford, of Yreka, recently counted 108 animals near Mount Dome. This is an increase of sixteen head over the last count of these antelope. This increase is apparently due to the careful enforcement of the law which gives total protection to the antelope—J. O. Miller, *Yreka, California.*

REPORTS.

SEIZURES—FISH AND GAME; ILLEGALLY USED FISHING APPARATUS.

Game.

Deer meat	141	pounds
Quail	253	
Ducks	797	
Doves—pigeons	9	
Rabbits—squirrels	2	
Pheasants	3	
Swan	1	
Mudhens	18	
Miscellaneous birds	80	
Deer hides	1	

Fish.

Striped bass	617	pounds
Halibut	1,000	pounds
Salmon	3,031	pounds
Young smelt	415	pounds
Trout	8	
Crabs	2,164	
Crab meat	30	pounds
Abalones	37	
Clams—Pismo	101	
Clams—cockle	232	pounds
Lobsters	811	
Illegal nets	9	

Searches.

Illegal fish and game	9

VIOLATIONS OF FISH AND GAME LAWS.

October 1, 1920, to December 31, 1920.

Game.

Offense	Number of arrests	Fines imposed
Hunting without license	47	$853 00
Hunting on posted grounds	4	130 00
Trapping without license	2	35 00
Deer—closed season—killing or possession	13	625 00
Does—spike bucks—fawns—killing or possession	4	225 00
Illegal deer hides	2	30 00
Brush rabbits—squirrels—closed season—killing or possession	5	150 00
Quail—closed season—excess limit—killing or possession	35	1,048 00
Doves—closed season—killing or possession	1	25 00
Ducks—excess limit—closed season—killing or possession	14	480 00
Mudhens—closed season—killing or possession	3	75 00
Wild pheasants—swan—closed season—killing or possession	6	275 00
Non-game birds—killing or possession	33	660 00
Protected shore birds—killing or possession	15	400 00
Bear—closed season—killing or possession	2	20 00
Shooting from power boat	8	35 00
Night hunting	17	550 00
Destroying state evidence	1	30 00
Total game violations	212	$5,646 00

Fish.

Angling without license	6	$150 00
Fishing for profit without license	2	20 00
Clams—undersized—excess limit—taking or possession	16	375 00
Crabs—undersized—taking or possession	4	95 00
Abalones—undersized—excess limit—taking or possession	4	100 00
Lobsters—undersized—excess limit—taking or possession	10	170 00
Striped bass—under weight—offering for sale closed season—excess limit	6	140 00
Halibut—excess limit	1	50 00
Selling steelhead not properly tagged	1	75 00
Young fish—taking or possession	3	60 00
Fishing in restricted waters	1	
Illegal nets in restricted districts	6	200 00
Total fish violations	60	$1,435 00
Grand total fish and game violations	272	$7,081 00

CALIFORNIA FRESH FISHERY PRODUCTS FOR MONTHS OF OCTOBER, NOVEMBER, DECEMBER, 1920.

Compiled by Fish and Game Commission, Department of Commercial Fisheries.

Species of fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Sacramento, San Joaquin	Contra Costa, Alameda	San Francisco, San Mateo	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego	Total	Mexican
Albacore											96,633		993	97,626	
Anchovies			60				20,350		96,081				14,170	130,661	
Barracuda								3,573	22,610	78,716	298,008	251	32,943	436,101	1,530,931
Bluefish								36	15,531					15,567	
Boccaccio							10,186	72,326	291,278					373,790	
Bonito								41	36	11,924	287,260		20,060	319,321	54,584
Carp				147	1,296	6,686								8,129	
Catfish		7,881		3,986		5,950								17,817	
Chilipepper								33,438	150,813					184,251	
Cultus cod	30						51,005	11,199	63,878					126,112	
Eels												180		180	
Flounders	406		44	583		3,451	15,877	875	640		554			22,430	
Grayfish						65	20,950	1,375	710		15,389	234	89,507	128,230	
Hake							58,057							58,057	
Halibut							1,242	38	285	27,463	175,427	2,036	38,564	245,055	574,468
Hardhead					197	270								467	
Herring	739		17,239			2,020	28,040							48,038	
Kingfish							671	18,814	11,500		57,257	672	1,520	90,434	48
Mackerel								2,175	123,404	6,406	683,247	7,248	12,713	835,193	10,824
Perch	4,302		15,648			3	22,653	1,000	1,005	41	10,708	1,119	1,995	58,474	4,950
Pike				42	433	1,994								2,469	
Pompano							459		51		7,705			8,215	
Rock bass										9	35,618	1,254	10,518	47,399	1,980
Rockfish	1,016						102,982	85,403	178,517	5,172	235,294	4,394	242,090	854,868	10,932
Sablefish							181,692							181,692	
Salmon	331,459		94	17,542		12,877	21		38					362,031	
Sand dabs							46,590	12,444	90		1,781			60,905	
Sardines						200	424,985	3,122,554	20,415,121		69,116		158,981	24,190,957	
Sculpin											12,629	95	2,195	14,919	
Sea bass—black										743	14,453		3,823	19,019	24,112
Sea bass—white			15,892				3,253	11,360	629	28,778	60,228	1,134	2,733	124,007	31,740
Sea trout							24						42	66	

Shad				78		755								833	
Shad—buck						88								88	
Sheepshead										85	1,772		2,037	3,894	
Skates							19,095		140		87			19,322	
Skipjack								84			730,775	77	588,409	1,319,345	
Smelt	7,467		3,527			320	3,842	1,391	26,895	6,444	50,603	93,293	7,895	201,677	13,002
Sole	33						594,119	237,756	1,161		10,764		947	844,780	530
Splittail					798	644								1,442	
Striped bass			24	9,782		91,609	1,873							103,288	
Stingaree													1,485	1,485	
Suckers					551									551	
Swordfish											2,598		370	2,968	
Tomcod							4,450	480						4,930	
Trout—steelhead	1,089													1,089	
Tuna											243,267	35	585,911	829,213	25,903
Tuna—bluefin											6,070			6,070	
Tuna—yellowfin											1,031,522			1,031,522	
Turbot			334											334	
Whitebait			542											542	
Whitefish											2,607	150	1,165	3,922	435
Yellowtail										991	994,762	1,663	182,790	1,180,206	96,935
Miscellaneous	851		6				10,234	31,448	4,194	46,297	8,433	581		102,044	
Total fish	347,392	7,881	53,410	32,160	3,275	126,932	1,622,650	3,647,810	21,404,607	213,069	5,144,567	114,416	2,003,856	34,722,025	2,381,374
Crustaceans—															
Crabs (doz.)	39		169				11,692	7						11,907	
Shrimps							73,697				681			74,378	
Spiny lobsters										29,584	93,079	3,077	33,565	159,305	281,878
Mollusks—															
Abalones									182,852	40,435				223,287	28,355
Clams—cockle	140		1,812											1,952	
Clams—mixed	5,355	36	6,719			804								12,914	
Clams—Pismo								75		52,139				52,214	
Clams—softshell			4,440			54,607	17,065							76,112	
Cuttlefish							1,572	130	6,483		17			8,202	
Mussels						76	288	125						489	
Oysters—															
Eastern (No.)			255,537				1,390,947							1,646,484	
Native			1,905											1,905	
Snails											60			60	
Squid									440		110			550	

All amounts shown in pounds unless otherwise specified.

STATEMENT OF EXPENDITURES.

Period from July 1, 1920, to January 31, 1921.

Administration:		
Commissioners	$ 310 68	
Executive offices	14,870 58	
Printing	3,259 87	
Research and publicity	3,533 79	
Accident and death claims	1,179 53	
		$23,154 45
Commercial fish culture and conservation:		
Superintendence	8,737 52	
Inspection and patrol	17,803 38	
Research	18,096 36	
Statistics	5,778 17	
Market fishing license commissions	299 50	
Propagation and distribution of salmon	16,748 52	
		$67,463 45
Sporting fish culture and conservation:		
Superintendence	9,137 87	
Printing	172 04	
Prosecutions and allowances	212 50	
Angling license commissions	11,734 60	
Fish exhibits	4,293 19	
General patrol—pro rata share:		
San Francisco District (40 per cent)	22,457 19	
Los Angeles District (40 per cent)	9,566 74	
Sacramento District (40 per cent)	16,842 10	
Propagation and distribution of trout	94,031 27	
		$168,447 50
Game conservation:		
Printing	199 83	
Prosecutions and allowances	957 98	
Hunting license commissions	18,078 90	
Mountain lion hunting (and bounties)	4,842 58	
General patrol—pro rata share:		
San Francisco District (60 per cent)	33,553 68	
Los Angeles District (60 per cent)	14,259 67	
Sacramento District (60 per cent)	25,259 98	
		$97,152 62
Tahoe camping ground		402 11
Grand total		$356,620 13